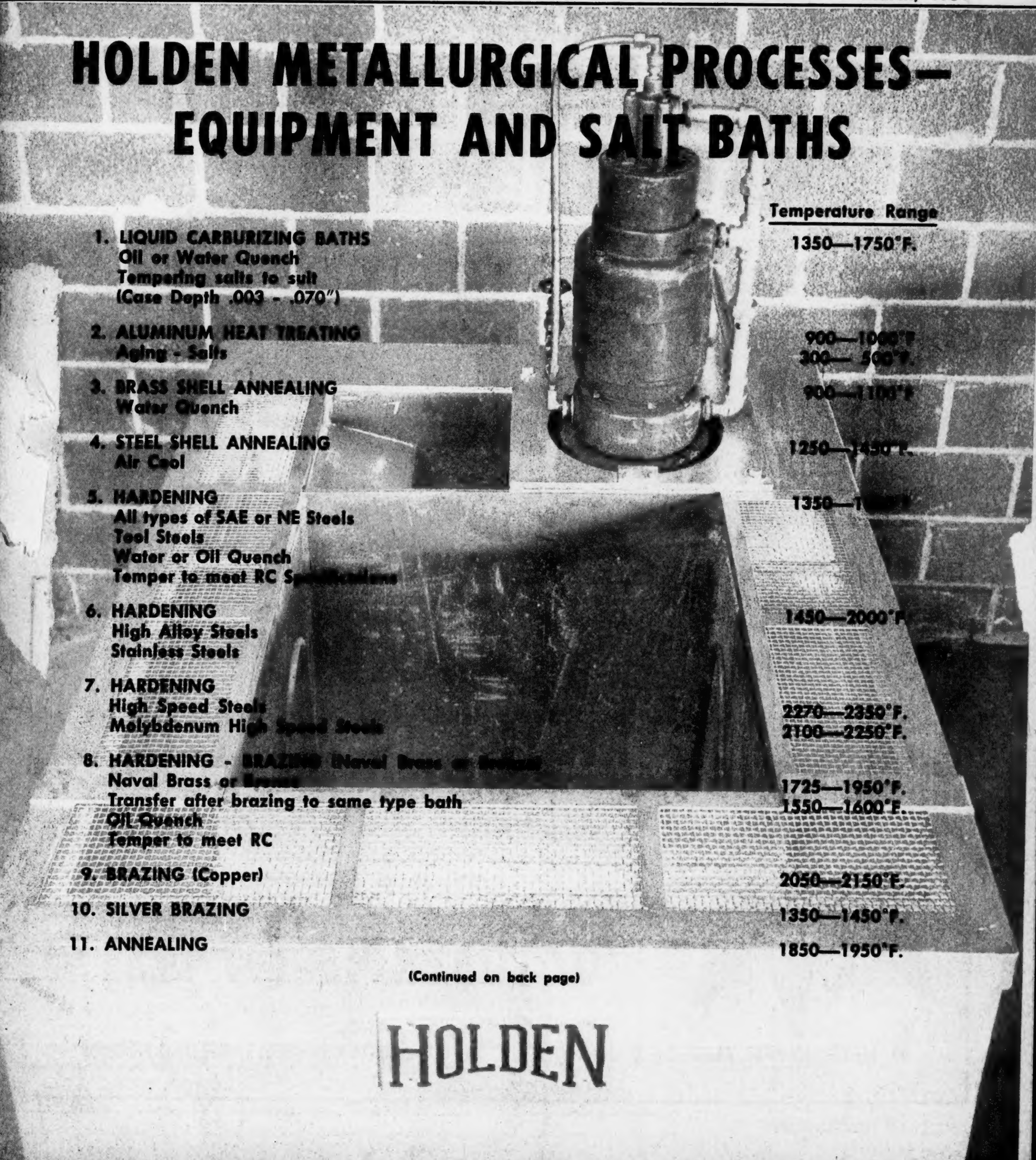
Metals Review

THE NEWS DIGEST MAGAZINE

Volume XXIV - No. 3 March, 1951



Metals Review

THE NEWS DIGEST MAGAZINE

VOLUME XXIV, No. 3 **MARCH, 1951**

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DEPARTMENTS

ASM REVIEW OF METAL LITERATURE

NATIONAL METAL CONGRESS & EXPOSITION

Michigan State Fairgrounds, Detroit, Mich. • October 15-19, 1951

Competition for Students at the 1951 ASM Metallographic Exhibit

THE DETAILS .... ▶ Undergraduates can now compete on an equal basis at the metallographic exhibit held each year at the National Metal Congress and Exposition without limitations as to subject matter or techniques. Separate panels will be erected for adequate display of their best work. Excellence will be judged by the same jury that appraises the work of professionals. Prizes will be awarded as follows:

First Prize—Bronze Medal and $25 cash.
Honorable Mentions—Ribbon and $10 cash.

THE RULES .... ▶ Entrants are restricted to undergraduate students of academic institutions. ¶ No more than two entries will be accepted from a single student. ¶ Work must be done during the 1950-51 academic year. ¶ Entries must be mounted separately on stiff cardboard. ¶ Each mount must contain pertinent information regarding subject, etchant, magnification, and special techniques (if any). ¶ Maximum size of mount, 14 x 18 in. ¶ Entrant must sign mount and give name of institution, course being studied, and year of graduation. ¶Mount must be signed by departmental head, as evidence that the above conditions are met.

Send Entries (BEFORE JUNE 1, 1951) to

METALLOGRAPHIC EXHIBIT—***Student Division***

7301 Euclid Avenue • Cleveland 3, Ohio

The Reviewing Stand

EVERY once in a while someone comes up with an idea that meets with unexpected—even overwhelming—success. Such was the idea that led to the publication of the special "Junior Members' Placement Service" in last month's *Metals Review.*

Looking over our junior member rolls, we envisaged an interested response from perhaps 100 graduating metallurgists. Instead we were swamped with 295 applications!

A lot of time, labor and expense went into the production of this 40-page section. The engraver's bill alone came to nigh onto $1000, while the preparation and distribution of 5000 reprints to industry was no small matter either.

But hang the expense, we say, when a new service meets with such unqualified approval as this one. One letter, reproduced below, from the Virginia Polytechnic Institute A.S.M. group expresses the student's viewpoint, while a series of comments from heads of metallurgy departments at the various engineering schools throughout the country indicates how the faculty feels about it.

The Students' Viewpoint

"We, the members of A.S.M. here at V.P.I., would like to express our appreciation for the work you have done for the undergraduates in metallurgy. It is our opinion that the personal sheets that will be published next month will do a great deal for us when we complete our training in June.

"We would also like to thank you for the space devoted to these personal sketches in *Metals Review.* Realizing the importance of the magazine in the industrial field, we feel that this will bring us in contact with persons and companies we as individuals would never be able to contact.

"Let us again say 'thanks' to you, and may this project be successful for you and very profitable for the members of A.S.M."—*Roy F. Adams, corresponding secretary, V.P.I. Chapter A.S.M.*

The Faculty Viewpoint

"We certainly appreciate the interest being shown by the American Society for Metals in placing the names of our metallurgical students before the industry."—*University of Alabama.*

"We greatly appreciate the services you are offering."—*California Institute of Technology.*

"I personally believe this is an important and worthwhile activity both from the standpoint of employers and also from the viewpoint of graduating students. We at the University of California wish to endorse this program and to participate as fully as possible." —*University of California.*

"The newly inaugurated policy of extending the Society's employment services to junior members is very much appreciated by the faculty here."—*Carnegie Institute of Technology.*

"I feel that the policy of the American Society for Metals in assisting in the placement of its junior members is an excellent one, and will be of real benefit to both the students and to the Society."—*University of Cincinnati.*

"I think this is a very good thing. It has been called to the attention of all of our seniors."—*Colorado School of Mines.*

"We are enthused about the splendid service you are planning for graduate metallurgists. .... Please accept our congratulations for adding another to the long list of advantages of becoming a member of the American Society for Metals. I hope you will repeat the program next year."—*Illinois Institute of Technology.*

"Your recent communication is a very fine idea, and another example of the fine service offered by A.S.M. .... I hope your new program can be carried into the future when the employment situation is more difficult, and the boys have to get out and beat the bushes to find employment."—*University of Illinois.*

"I am sure that all of us here appreciate your splendid effort in setting up this student placement plan for junior members. .... We hope the junior member placement program will become a regular, successful feature. It's a good idea."—*University of Kansas.*

"I wish to congratulate you and the Society for the very commendable program you have established to widen the service to junior members seeking employment."—*University of Kentucky.*

"I think your idea is a splendid one."—*Lafayette College.*

"This service will be particularly valuable to junior members when jobs are scarce but it will be valuable now, also, in providing a wider range of choice for each graduate."—*Lehigh University.*

"I have discussed this project with several members of the staff and they all agree that it is an excellent thing for the American Society for Metals to do for its junior members."—*Massachusetts Institute of Technology.*

"This appears to be a very worthwhile service that the Society is providing."—*Michigan State College.*

"Enlarging the services of the A.S.M. to the junior members is a very commendable idea. The present project should prove popular with junior members."—*University of Michigan.*

"I would like to say that I am wholeheartedly behind your plan. This is an excellent idea that should help out both the Society and the junior members."—*University of Minnesota.*

"I would like to express my appreciation of the excellent project undertaken by the A.S.M. We will certainly do our utmost to cooperate with you."—*University of Notre Dame.*

"The action which the American Society for Metals is taking .... is commendable."—*Pennsylvania State College.*

"I congratulate you for initiating this activity with its dual benefits—the obvious one of helping him find a job and the less obvious but perhaps more important one of encouraging him to join the Society earlier and reap the benefits thereof."—*University of Pennsylvania.*

"I was delighted to learn of the new service which the American Society for Metals is to render its junior members. .... The best of luck to you in rendering this most excellent service."—*Rensselaer Polytechnic Institute.*

"I believe that this is a fine idea and am very happy to know that A.S.M. is making this effort."—*South Dakota School of Mines & Technology.*

"I most heartily approve of the action A.S.M. is taking to assist our junior members."—*Virginia Polytechnic Institute.*

"We heartily approve of this plan and feel sure that it will be helpful to the junior members of the Society. If we can help you further with this project, please let us know."—*State College of Washington.*

"I am glad that the Society is doing this piece of work. It is a valuable service, and strengthens the bond between the school and the national organization."—*University of Washington.*

"I believe this new move on your part will be very beneficial to industry. I sincerely hope this service, which is being given a trial run, will be continued."—*University of Wisconsin.*

M.R.H.

Two Fields of Surface Cleaning Are Explored

Reported by W. O. Manuel
Metallurgist, AC Spark Plug Div., G. M. C.

Two fields of surface cleaning were thoroughly explored at a meeting of the Saginaw Valley Chapter A.S.M. on Jan. 16. W. R. Naas addressed the group on mechanical methods of surface cleaning and C. W. Gardner covered the chemical cleaning field. Both gentlemen are affiliated with the process development section of General Motors Corp.

Mechanical surface cleaning of metals had its start as far back as 1870, Mr. Naas explained. Since then it has made notable advances, especially in the past few years, which have seen the development of continuous barrel-type blast cleaning equipment and the use of cut wire and cast steel shot as abrasives.

The national program of preventing river and stream pollution by banning the dumping of pickling acids has promoted the growth of mechanical cleaning in many forging plants in the past few years. Substantial savings have frequently resulted.

Mr. Naas described the various types of mechanical cleaning equipment and their component parts. He compared the metallic abrasives as to hardness, form, cost and life. Many variables are encountered in all blast cleaning installations, and the speaker suggested a test procedure for determining the economies of the various abrasive types.

Cut wire shot costing $240 to $300 per ton (17-gage) offers a laboratory fatigue life of 1670 cycles as against a fatigue life of only 10.5 cycles for chilled cast iron shot costing $80 to $90 per ton. However, with inadequately maintained machines or improper cleaning practices, he pointed out, the wire shot may be less economical than the cast iron.

The cost of cleaning with the new continuous barrel-type cleaner varies from $.64 to $1 per ton in a 10-ton capacity machine. The cost may run as high as $3 per ton in batch and table types.

Mr. Gardner then took over for the chemical cleaning field. While parts are often cleaned for welding, plating and painting, he confined his discussion to the field of cleaning for scale removal.

Pickling in sulphuric acid accounts for 80 to 90% of the scale removal on low-carbon material today. The cost has increased because of the present problem of disposing of the spent acid without polluting American streams and rivers.

Scale on steel is thought to consist of four layers of iron oxides. The outer layer is composed of ferric oxides with high oxygen content which are insoluble in sulphuric acid, but the layer next to the steel, which is ferrous oxide, is soluble and therein lies the secret of pickling. Because of imperfections in the scale layers, the acid is able to penetrate and attack the innermost layer. A reaction that is similar to a galvanic cell helps accelerate the formation of hydrogen which blasts off the scale.

Three major methods of acid pickling are by (a) immersion, which is the most familiar, (b) spray, for light scale, and (c) flow. The latter has the greatest potentialities in descaling strip steel.

Inland Steel Co. is using the flow method with remarkable success. A high bath temperature (180 to 200° F.) is used and the acid is regenerated at the end of the flow. Higher temperatures and bath concentrations overcome the deleterious effect of ferrous sulphate, which lowers pickling efficiency.

Costs of chemical cleaning vary widely, Mr. Gardner said. Straight-line acid pickling ranges from $.85 to $1.85 per ton, while electrolytic pickling may cost up to $4 per ton.

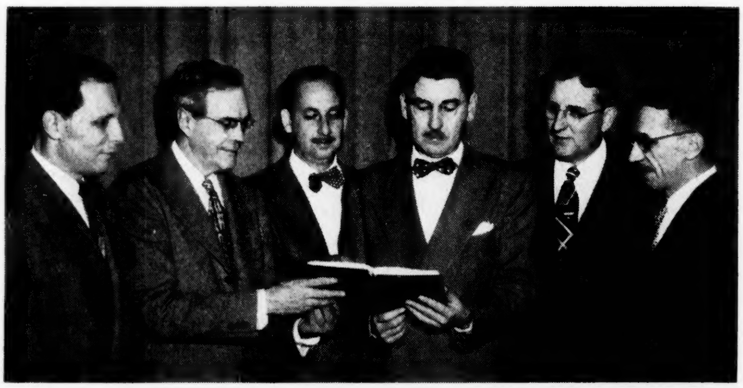
Rhode Island Sponsors Educational Program

An educational course on "Elementary Physical Metallurgy" is currently being conducted by the Rhode Island Chapter A.S.M. The course consists of eight lectures combined with demonstrations and some experimental work. The lectures are based on the A.S.M. text, "Introductory Physical Metallurgy" by Clyde Mason.

Arrangements were made with the Division of General College Extension of Rhode Island State College to give the instruction. The course started on Feb. 13, and is continuing for eight weekly meetings of 2½ hr. each through March and April. A fee of $15 covers all expenses, including a copy of the text. Enrollment was limited so that each person could participate in the experimental work and demonstrations.

The Education Committee consists of Maurice Roberts, United Wire and Supply Co.; Richard Harvey, Brown and Sharpe Mfg. Co.; and Kenneth Mairs, Rhode Island State College.

Lecturers on Modern Steels



Lecturers for Dayton Chapter's Recent Educational Course Were (From Left): L. L. Jaffe, Supervisor, Manufacturing Research Laboratory, Frigidaire Division, G. M. C.; R. R. Kennedy, Chief, Metallurgical Branch, Wright Field; R. W. Edmonson, President, Metallurgical Service, Inc.; S. R. Prance, Chief Metallurgist, Inland Mfg. Division, G. M. C.; R. P. Koehring, Chief Metallurgist, Moraine Products Division, G. M. C.; and G. A. Baker, Vice-President, Duriron Co., Inc. Not shown is J. D. Loveley, chief engineer, Airtemp Division, Chrysler Corp.

The enthusiasm of the classes in Dayton Chapter's recently completed seven-lecture course on "Modern Steels" was reflected in the attendance. It averaged 224 for each session, with 153 certificates awarded for perfect attendance records.

According to O. G. Saunders, chairman of the Educational Committee, the success of the course should be largely attributed to the excellent presentation of their material by the lecturers, pictured and listed above. Slides provided by the A.S.M. national office were used to illustrate the lectures, and in some instances were augmented by motion pictures of specific subjects.

The all-important groundwork and organization were handled by William McCrabb, chairman of the Dayton Chapter, and the Educational Committee, consisting of James J. Niehaus, Isaac Perlmutter, Howard Chalfant, and O. G. Saunders, chairman of the committee.

Lehigh Valley Celebrates Stoughton Night

Bradley Stoughton (Left), Professor Emeritus at Lehigh University, Presents the Stoughton Award to H. C. Bigge, Superintendent of the Toolsteel Department of Bethlehem Steel Co., in Recognition of His Outstanding Work in the Improvement of Electric Steelmaking

James P. Gill (Right), Vice-President of Vanadium-Alloys Steel Co., Was the Speaker at Lehigh Valley Chapter's "Stoughton Night". At left is George A. Roberts, who handled the question-and-answer period, and center is Joseph E. Libsch, Chapter chairman

Reported by Frank H. Laxar
Department of Metallurgical Engineering, Lehigh University

Lehigh Valley Chapter's annual "Stoughton Night" meeting on Jan. 5 featured James P. Gill, executive vice-president of Vanadium-Alloys Steel Co., as the principal speaker. Just before the technical meeting, H. C. Bigge, superintendent of the toolsteel department of Bethlehem Steel Co., was presented the chapter's Stoughton Award for his outstanding work in the improvement of electric furnace steelmaking. The award was presented by Dr. Stoughton himself, professor emeritus of metallurgy at Lehigh University, in whose honor the award was established.

Mr. Gill was introduced to the 175 members present by D. A. St. Clair, manager of toolsteel sales for Bethlehem Steel Co. His subject was "New Developments in Toolsteels."

Mr. Gill first gave some interesting information on free-machining die steels of the hot work types, which developed from graphitic steels. Medium-alloy, medium-carbon steels with additions of lead or silver for machinability are in use today and have given surprisingly little trouble with segregation, he said. Another class, the high-alloy steels, contain equal amounts of tungsten and chromium, a typical steel having 12% tungsten, 12% chromium, and 0.30% carbon. The microstructure of such a steel always is a mixture of ferrite and martensite after heat treatment. Vanadium increases the hot hardness of these steels considerably.

Recent advances have also been made in the field of high speed steels. High carbon and high vanadium contents lead to formation of a complex vanadium carbide which has a hardness higher than that of aluminum oxide. This carbide increases the wear resistance of the steel.

In conclusion, Mr. Gill spoke about surface hardening to increase die life by pack carburizing at 1950° F. This method has met with marked success.

George A. Roberts, chief metallurgist of Vanadium-Alloys Steel Co., ably handled a long and spirited question-and-answer period. An amusing coffee talk following the dinner was given by H. M. Kraner, research engineer, Bethlehem Steel Co., on "Unusual Patents".

The first announcement of a series of five educational lectures which the Chapter is sponsoring was made at the meeting. The subject is "The Selection and Application of Metallic Materials", each lecture to deal with one type of material. All sessions are at Lehigh University, with the first one held on March 6.

Radiant Heating Described

Reported by G. A. Stemple
Consolidated Gas, Electric, Light & Power Co.

Progress is rapid in most fields of engineering, but in few fields is it so rapid as in "Industrial Gas Radiant Heating," which was the topic of the technical session of the Baltimore Chapter A.S.M on Jan. 15. The session was addressed by James R. Kniveton, vice-president of Selas Corp. of America, Philadelphia. Mr. Kniveton's talk was reported in the Febary issue of *Metals Review,* page 16.

The coffee speaker of the evening was L. H. Armstrong of the Maryland Department of Mental Hygiene. His topic was "The Operation and Maintenance of Mental Institutions."

Prof. Hunter Honored by Prize Fund at Rensselaer

A $2,000 fund has been subscribed by 137 former students of Matthew A. Hunter, retired dean of the faculty at Rensselaer Polytechnic Institute, to establish a prize in his name. The annual net income from the fund will be awarded the senior in metallurgy whose graduating thesis is adjudged the best.

Before Dr. Hunter became dean of the Rensselaer faculty in 1947, he had for 12 years been head of metallurgical engineering. Prior to the founding of the department in 1935 he had organized research in metallurgy at the Institute while he was head of electrical engineering.

The award, to be formally known as the Matthew Albert Hunter Prize, will be made for the first time at the June commencement. The metallurgical faculty, headed by Dr. Wendell F. Hess, will select the winner.

Tells How Impurities Control Supercooling and Solid Transformations

Reported by George Sorkin
Metallurgist, U. S. Navy Bureau of Ships

One of the most interesting fields of study, and one that has engaged the attention of many prominent metallurgists in recent years, was discussed by John H. Hollomon, assistant manager, metallurgy and ceramics division, Research Laboratory, General Electric Co., at the January meeting of the Washington Chapter A.S.M. After presenting a rigorous mathematical analysis of the problem of nucleation and transformation, Dr. Hollomon continued in less technical language to explain the phenomena of phase changes.

In examining metal transformations and their causes, it is important that we take note of the role that impurities play in the liquid-solid reaction. By proper control of impurities, a molten metal may be supercooled hundreds of degrees. This amount of supercooling does not occur under ordinary circumstances because of the influence of the container and of impurities. Transformation can be started by nuclei of foreign material as small as 10 to 20% of the volume of base material.

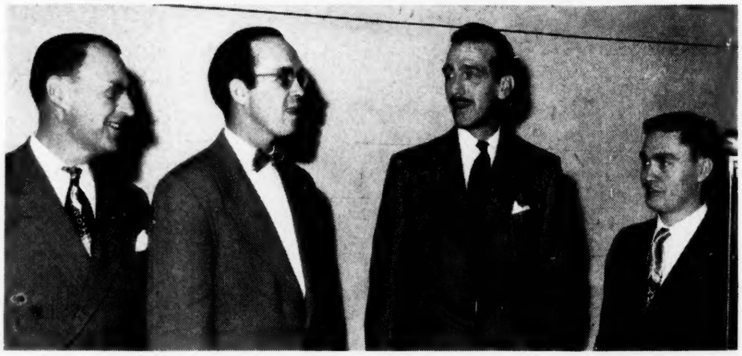
Impurities can be controlled experimentally by finely dividing the base material. It has been demonstrated statistically that by reducing the particle size, the chance of an individual particle containing an impurity is reduced. With finely divided metal powder, in general, the ratio of degrees of supercool to melting point of metal in degrees absolute is approximately 0.2.

Experiments with various impurities have determined that each catalyst has a specific effect on the supercooled temperature. The idea of nucleating supercooled liquids has been popularized in experiments to "seed" clouds and thus cause rainfall. It has been found that different soils have different effects on the clouds.

Dr. Hollomon pointed out that solid-to-solid transformations, such as the austenite-martensite transformation and recrystallization, are also controlled by impurities. There are two kinds of precipitation hardening. "Coherent" precipitation hardening occurs when the precipitate matches the structure of the base lattice; when the precipitate does not match the base lattice, precipitation is known as "incoherent" and usually occurs more slowly.

Nucleation and transformation reactions are not specific to metallurgy and find application in such diverse fields as cell growth, explosions, and weather, Dr. Hollomon pointed out in concluding his talk.

Outlines Status of Titanium Today



T. W. Lippert (Third From Left), Manager of Titanium Metals Corp. of America, Brought the Indianapolis Chapter up to Date on Titanium in January. From left are Howard Fletcher, chapter vice-chairman; John Mitchell, chairman; Mr. Lippert; and John Frantzreg, technical chairman

Reported by S. A. Minton, Jr.
Allison Division, G. M. C.

Today's production of titanium, according to T. W. Lippert, manager of Titanium Metals Corp. of America, is primarily by induction or arc melting. Mr. Lippert addressed the Indianapolis Chapter A.S.M. on Jan. 15. The iodide method, he said, is inherently too expensive, and even the Kroll process must undergo considerable modification and improvement.

It is probable that the present cost of $10 per lb. of bar stock and $20 for sheet will be decreased by improvements such as continuous casting, the speaker predicted. Sponge from conventional Kroll equipment may show encouraging cost reductions if the present batch process is changed to continuous or semi-continuous operation. Iodide titanium is reportedly available at $190 per lb.

In 1950 about 60 tons of ingot—converting to 40 tons or so of finished mill products—was produced at an average cost of $30,000 per ton. By the end of 1951, Mr. Lippert estimated, output may advance to about a 3000-ton annual rate.

Alloys are now known that have a tensile strength in the annealed condition of 200,000 psi., with 12% elongation and a high yield-to-tensile ratio. Impact strength is high, fatigue strength high but variable, and creep strength adequate. Strength-weight ratio is the highest known for any metal. Damping capacity is as good as some steels and corrosion resistance better than many of the special alloy steels; it is phenomenal in salt water. Wear resistance is erratic—poor in certain service conditions but in other applications outlasting the best of competitive materials as much as 400 to 1. Low thermal conductivity and electrical resistance indicate useful applications where such properties are desired.

Alloys of titanium are now used in disks and blading of jet engine compressors. It is estimated that two tons of titanium are desired for many of the new prototype bombers. The high skin temperature from frictional heat of fast-flying pursuit planes may lead to substitution of titanium for aluminum. Titanium is under experiment for landing gear and is used in the supersonic propellor. Some of it has been made available to the chemical industry and has outperformed standard plant equipment materials. Because of its light weight, Army Ordnance is interested in many applications for man-carried and airborne weapons.

Questions after the formal talk revealed that titanium is only weldable to itself at the present time. The modulus of elasticity varies from 14 to 22,000,000 psi. Little work has been done on surface hardening. Ore supplies in the U.S. and Canada are adequate.

It was learned that the alloys cold work considerably faster than stainless steel; the 200,000-psi. alloy could probably be cold rolled to a tensile strength of 300,000 psi. Titanium is difficult to grind and wheel wear is extremely high. Machining is relatively easy—about on a par with stainless. High speed steel tools are recommended because of the strong tendency of titanium to weld to carbide-tipped tools.

Malcolm Speaks at Utah

Reported by H. Edward Flanders
University of Utah

Vincent T. Malcolm, director of engineering research and development for Chapman Valve Mfg. Co., spoke on "Welding for High-Temperature, High-Pressure Materials" before the Utah Chapter A.S.M. on Jan. 30. The occasion was a joint meeting with the local group of the American Welding Society, attended by 90 people.

Cites Characteristics Of Three Types of Deep Drawing Steels

Reported by James H. Brown
Ritter Co., Inc.

At the Jan. 8th meeting of the Rochester Chapter A.S.M., a large audience heard a most interesting and instructive talk on "The Metallurgical Aspects of Deep Drawing Steel". The speaker, Samuel Epstein, research engineer for the Bethlehem Steel Co., described in some detail the types and characteristics of the more important of these sheet steels. Mr. Epstein illustrated his lecture with many slides, and was aided in his delivery by John W. Frame, also of Bethlehem Steel Co.


S. Epstein

Mr. Epstein limited his lecture to the three most common types of deep drawing steels, namely rimmed, aluminum-killed and rimmed non-aging steel. Rimmed steel is characterized by an exceedingly clean, low-carbon skin, but unfortunately the steel will age on standing. To explain the aging phenomenon, Mr. Epstein told how annealed steels will show a marked yield point and will produce stretcher strain lines when drawn. The formation of stretcher strains is prevented by lightly cold working the sheet with a 1% reduction called skin rolling. Aging is the tendency of steels that have been skin rolled to harden slightly after a period of time, and show stretcher strain lines on being drawn.

To eliminate this aging property, aluminum is added to the melt to produce aluminum-killed steel. Such steel is excellent for deep drawing and will not age, but, because of the presence of aluminum oxide, does not yield as perfect a surface finish as the rimmed steel sheet.

To obtain the combined advantage of non-aging with rimmed steel's deep-drawing surface finish, vanadium is added to the melt. Vanadium reacts with the nitrogen in the steel, but does not appreciably deoxidize the melt and spoil the rimming.

The best test for drawability of steel, Mr. Epstein pointed out, is not the hardness of the steel sheet but is the elongation prior to necking. Unfortunately, this measurement is difficult to make with a tensile test specimen, and therefore a more practical application of its principle is used. In this test, a large circular sample is held at the circumference and bulged by hydraulic oil pressure until failure occurs. The elongation of the center section of the bulge gives a good indication of the actual drawability of the steel.

Alloying elements in deep drawing steel fall into two classifications: main elements and residual elements. Of the main elements, carbon, phosphorus, sulfur and manganese all are kept low to avoid their hardening effect; manganese, however, should be held at 0.3% for best hot rolling. The residual elements—copper, tin, nickel and molybdenum—are unavoidably introduced in the scrap used, and because of their hardening effect are held down to a total percentage for the group of 0.15%. Vanadium, added to produce the non-aging rimmed steel, is maintained at about 0.03%.

The coffee talk was given by Arthur Underwood, a Fellow in the Royal Photographic Society, who presented a series of exceptionally beautiful Kodachrome slides from his collection, along with comments on their composition to aid A.S.M. shutterbugs in their hobby.

E. E. Thum at Penn State

Reported by William W. Wentz
Pennsylvania State College

Ernest E. Thum, editor of *Metal Progress,* addressed the Penn State Chapter at the January technical meeting. In his talk, "The Metallurgical Aspects of Atomic Energy", Mr. Thum discussed the possible peacetime applications of atomic energy. His talk was reported in detail in the January issue of *Metals Review,* page 15.

Tells of New Developments And Uses for Ductile Iron

Reported by J. J. Preisler
Sperry Gyroscope Co.

A discussion of the mechanical properties and specific applications of ductile iron was presented by William C. Mearns before a meeting of the New York Chapter A.S.M. on Dec. 11. The speaker also described heat treating and welding techniques for this new material, together with other pertinent engineering considerations.

Mr. Mearns pointed out that the bursting strength of ductile iron is two to three times that of gray iron; moreover, it does not shatter. He described the welding of ductile iron water pipes in 6, 8 and 12-in. diameters. Heat treatment of gears was covered, and the speaker cited various applications in general machinery fields.

A series of slides illustrated the material covered in the lecture. Among them were an 8-in. ductile iron pipe, cast at the Lynchburg Foundry, Lynchburg, Va., demonstrating the bursting test; a cylinder which developed greater bursting strength than gray iron, tested by Ingersoll-Rand, Phillipsburg, N. J.; tuyere replacements for stokers cast at the Pitz Foundry, Inc., Brooklyn, N. Y.; a chemical retort pot cast at the Treadwell Engineering Company, Easton, Pa.; and a series of gears cast at Sacks-Barlow Foundries, Inc., Newark, N. J.

Mr. Mearns is in charge of the Central Atlantic Coast section of the development and research division of International Nickel Co.

Speaks on Effect of Alloying Elements

Reported by Andreas Hartel, III
Hartel Brothers Co.

A. B. Kinzel, president of the Union Carbide & Carbon Research Laboratories, Inc., and vice-president of the Electro Metallurgical Division of the Corporation, spoke on the effect of alloying elements on steel before the Boston Chapter A.S.M. on Jan. 5.

Emphasizing the significance of yield-strength ratio in modern design, Dr. Kinzel presented a plan whereby engineering design could be predicated on this yield-strength ratio modified by an additional factor. This factor is based on ability to deform plastically with reduction of area as a satisfactory index for applications involving a static load.

On special request from the audience, Dr. Kinzel also touched upon possible steelmaking substitutions, such as vanadium for molybdenum, tantalum for columbium, and other methods of conserving scarce and strategic alloys.

A. B. Kinzel (Left), President of Union Carbide & Carbon Research Laboratories, Spoke Before the January Meeting of the Boston Chapter. At right is Robert S. Rose of Latrobe Electric Steel Co., who acted as technical chairman. (Photograph by H. L. Phillips)

Advantages of Careers In Metallurgy Depicted At Father & Son Night

Reported by J. P. Simpson
Chief Chemist
Canadian Car & Foundry Co. Ltd.

Montreal Chapter's first "Father & Son Night" in January was an innovation adopted to acquaint high school and pre-engineering students with the metallurgical profession. Professor J. U. McEwan of McGill University was the principal speaker. Two movies were also shown, one entitled "Streamlined Steel" through the courtesy of Bethlehem Steel Co., and the other "The Tale of the Powdered Pig," through courtesy of Reynolds Metals Co.

In his opening remarks Professor McEwan showed how our present civilization is dependent on an adequate supply of metals. Through the ages countries having the greatest quantities of metals were always in the ascendency when these metals were used to advantage, he explained. In considering the metallurgical industry as a whole—from the recovery of metals from ores to the final product, whether it be a frying pan or a gigantic battleship—we enter a field so broad in scope that anyone willing to apply himself with diligence and ambition can find an outlet suited to his particular qualifications.

Professor McEwan divided the study of metallurgy into two groups: metallurgical engineering for those interested in plant operation, and the science of metallurgy for those attracted to research and laboratory work. There is no clearcut line between these groups in early education, he pointed out. The engineer must be familiar with mathematics, chemistry and physics to understand and improve his operations, while the scientific man must understand operating procedures to apply his ideas.

Success in the metallurgical field has often been attained by people who for one reason or another were without a university training. Such a background naturally leaves much to be desired, but any young man who was willing to start at the bottom, work diligently, and further his education at night classes can assuredly come out on top.

While metals have been used since ancient times, metallurgy is just in its infancy, the speaker noted. We are all cognizant of the ingenious engineering toys made for the youth of today, but up to now no one has devised a toy smelter or heat treating furnace!

"I can only repeat," said Professor McEwan in concluding, "that the field is so broad that there is a place for a wide variety of interests and abilities. It offers an excellent future for the industrious, and promises that much-desired state of economic security at a reasonable age—not to be provided by a government but by experiences, knowledge and abilities emanating from 'above the ears'. These do not depreciate with changing conditions; in fact, they will steadily increase in value."

Australian Heat Treaters Meet

Five A.S.M. Members Were Among Those Who Attended the Annual Christmas Dinner of the New South Wales Heat Treaters in Sydney, Australia. Standing, left to right, are D. J. Alexander (ASM), leading heat treater, C. C. Engineering Industries; W. G. Lisson, heat treater for the same company; L. Bartush, foreman heat treater, Electricity Meter Mfg. Co.; A. S. Reardon (ASM), technical supervisor, heat treat department, C. C. Engineering Industries; R. Lightfoot (ASM), foreman heat treater, Commonwealth Moulding Co.; and Victor Wah Gow (ASM), foreman heat treater, C. C. Engineering Industries. Seated are C. V. O'Dea, heat treater, and O. S. Cook, cofounder and director, C. C. Engineering Industries; and R. Firth (ASM) supervisor, heat treat department, Tool Equipment Co. (Reported by A. S. Reardon)

Ductile Iron Progress Reported at Hartford

Reported by L. F. Spencer
Chief Metallurgist
Landers, Frary & Clark

Ductile cast iron, its characteristics, properties and applications formed the subject of an enlightening discussion before the Hartford Chapter A.S.M. in January. James E. Fifield, metallurgist, New England Technical Section, International Nickel Co., was the speaker, and Russell F. Marande, formerly foundry superintendent of North & Judd Co., performed an excellent job as technical chairman.

The unique spheroidal shape of the graphite particles of ductile cast iron was explained. By proper alloying and treatment, the matrix can be made ferritic, pearlitic, acicular, martensitic or austenitic.

Ordinarily, ductile irons have a pearlitic-ferritic matrix, and mechanical property specifications are being established for these grades. Most licensed foundries are able to offer both a high-strength and a high-elongation grade.

Mr. Fifield compared the engineering properties of the alloyed gray irons, malleable cast irons, cast steels, and ductile irons. Slides illustrating applications pointed out the usefulness of the material.

Austenitic ductile Ni-Resist was described as a new, tough, corrosion resistant metal with good machinability, good heat resistance, and excellent metal-to-metal wearing qualities. Magnesium-containing white irons, Mr. Fifield further pointed out, are stronger and tougher than ordinary white irons, and when combined with ductile cast iron cores, have good shock resisting properties.

Tells How Corrosion Resistance of Stainless Is Affected by Fabrication

Reported by George A. Fisher, Jr.
International Nickel Co., Inc.

The corrosion resistance of stainless steel was discussed from the aspect of how it is affected by various fabricating processes at a joint meeting of the St. Louis Chapters of A.S.M. and the American Society of Tool Engineers on Jan. 11. George A. Sands, assistant manager of development for the Electro Metallurgical Division of Union Carbide and Carbon Corp., was the speaker.

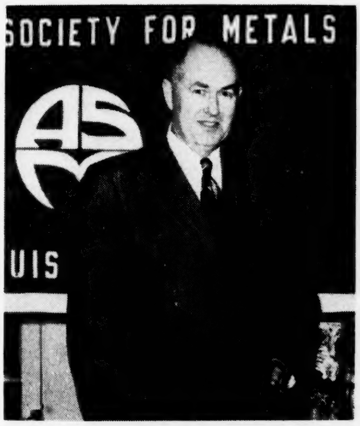
Mr. Sands defined and classified the stainless steels, and then discussed the effects of various alloying elements (Cb, Ta, Ti, Mo, S, Se, N, and Ni). Chromium, he said, is the primary element for resistance to oxidation. The other alloys are used to enhance the function of chromium in a specific manner, from either a corrosion or fabrication standpoint.

Columbium, titanium and tantalum, if used in the proper quantities, are the only three elements that will effectively prevent carbide precipitation and intergranular corrosion. A ferro-alloy containing 40% Cb and 20% Ta can be substituted for the regular ferrocolumbium alloy to inhibit intergranular corrosion, the speaker said. However, because the atomic weight of tantalum is twice that of columbium, it is necessary to add twice the weight of columbium to get equivalent results. Mr. Sands further pointed out that tantalum can be substituted point for point for columbium in the high-strength, high-temperature alloys.

The extra-low-carbon grades of stainless (0.03% C max.) are a good substitute for the stabilized stainless steels provided they are not used continuously in the carbide precipitation temperature range of 800 to 1500° F. The extra-low-carbon grades are entirely satisfactory for parts and equipment used in the as-welded or as-welded and stress-relieved condition.

Severe cold work will decrease the corrosion resistance of stainless steel, the speaker continued, but this is an important factor in a relatively few cases involving severe corrosion. Stress-corrosion cracking only occurs on metal surfaces in tension. In most instances it appears to be tied in with pitting or the reducing type of corrosion usually caused by a member of the halogen group. Stress-corrosion cracking is not yet fully understood, and Mr. Sands believes that there is much opportunity for study in this field. However, methods for the elimination of stress-corrosion by proper design and by stress relieving or annealing are fairly well understood.

Among the interesting questions raised during the discussion period was why the industry should have trouble in obtaining the extra-low-carbon grades. Mr. Sands stated that this question should rightfully be answered by the steel industry. However, it is his belief that the titanium-stabilized grades should be available because at the present time this element does not appear to be in short supply.



George A. Sands Speaking at St. Louis on Stainless Fabrication

In answer to how much nitrogen could be substituted for nickel, Mr. Sands pointed out that nitrogen and carbon are about 30 times as potent in forming austenite as nickel. Technically, 0.10% could be substituted for 3% Ni, but this may not be practical. Approximately 2% of the nickel has been replaced in some commercial heats with nitrogen, but manganese should also be increased to improve the hot working characteristics.

The basic causes for brittleness in the area adjacent to welds of Type 430 stainless steel are grain growth and stress, Mr. Sands replied in answer to another query. Prior and post heating were recommended in welding the straight chromium grades of stainless steel.

Asked about the functions of titanium and columbium, the speaker pointed out that these elements act in the same way; normally it is necessary to stabilize the carbon with four times its weight of titanium and eight times its weight of columbium. The columbium carbide appears more stable above 1650° F. than the titanium carbide.

The meeting was supplemented by an interesting movie showing the production of stainless steel from melting to finished forms. The film was obtained through the Bureau of Mines Film Library, and was produced by Allegheny Ludlum Steel Corp.

New Compaction Methods Illustrate Trends in Powder Metal Techniques

Reported by D. J. Girardi
Research Metallurgist
Timken Steel and Tube Division

Interesting new trends and developments in the field of powder metallurgy were presented by John Wulff, director of the Metal Processing Laboratory of Massachusetts Institute of Technology, at the Jan. 8th meeting of the Canton-Massillon Chapter A.S.M.

Dr. Wulff first reviewed the general operating steps or "unit processes" involved in the production of a finished part. Metal powders may be produced by various methods, such as gaseous reduction of the oxide, electrolysis, atomization, decomposition of halides, etc. These powders with or without a binder are then pressed into desirable—usually simple—shapes. This step frequently involves difficult problems in attaining a uniform and high density.

The pressing of the powder to shape is followed by sintering at a suitable temperature in an inert atmosphere. This causes the particles to weld to each other and further increases the densification. The presence of a liquid phase during sintering closes the pores by capillary action, and in this manner 100% of theoretical density may be realized.

Dr. Wulff then reviewed developments in the production of carbides and ceramets, in the infiltration of compacts by liquid metals and alloys, and in the coating of metal powders. New compaction processes include sheath rolling and extrusion. A new European process was also described for the direct rolling of thin iron strip from powder.

Dr. Wulff mentioned his own work on fragmentation compaction of brittle powders in ductile envelopes. In this process the material is tamped either as a powder or as a prepared briquette into an iron, nickel or stainless envelope, which is then sealed and cold forged to shape. Densities achieved vary from 80 to 98%. The completed article is sintered with or without envelope to increase its density and strength still further.

Carpenter Starts New Mill

A new $3,000,000 hot rolling mill will be constructed by the Carpenter Steel Co., Reading, Pa., according to Paul B. Greenawald, vice-president and plant manager. The new mill will be a combination strip, bar and rod mill designed and engineered to meet the particular requirements of the company's specialty production of tool, stainless and alloy steels. The project will be completed in a year or a year and a half.

Reveals First Details Of Boeing Model 502 Gas Turbine Engine

Reported by E. J. Turner
Boeing Airplane Co.

Metallurgical aspects of the Boeing Model 502 gas turbine engine were revealed publicly for the first time before the Puget Sound Chapter A.S.M. on Jan. 10. The speaker was W. L. Slosson, who has been in charge of metallurgical development and control in the Boeing gas turbine project for the past four years.

Mr. Slosson described the materials used throughout the engine and discussed the operational factors governing material selection, use, and inspection as applied to the main engine components. These are compressor, burner chambers, nozzle boxes, turbine wheels, shafts, bearings and reduction gears.

A centrifugal compressor is used on the Boeing gas turbine. The impeller is machined from a 14S aluminum alloy die forging and the finished part heat treated to the T-61 condition. The 14S alloy offers a good combination of corrosion resistance, forgeability, and high mechanical properties at room and elevated temperatures.

Burner liners are subjected to extremely high temperatures and thermal gradients during combustion. Such conditions promote rapid warping, cracking and oxidation of the liner material unless design is carefully controlled so that maximum cooling is provided by compressor air. Several liner designs and sheet alloys, including AISI 321 bare, stainless-clad copper, ceramic-coated AISI 321, and AISI 310 bare, are under test by Boeing in an effort to utilize lower alloy materials. Current burner liners are fabricated from 0.050-in. Inconel sheet.

Nozzle boxes are exposed to similar conditions, although to a lesser degree. The first-stage nozzle box is fabricated from AISI 310 sheet and precision-cast H.S.30 alloy blades. The second-stage nozzle box is fabricated from AISI 321 sheet and precision cast AISI 310 alloy blades. Here again, several materials are under test in a search for satisfactory lower alloys.

Both the first and second-stage turbine wheels are fabricated by welding H.S.30 precision-cast blades to a Timken 16-25-6 alloy forged hub. The manual metal-arc method is used with a 19-9 W-Mo alloy electrode. In an effort to obtain a lower-cost wheel concomitant with higher production, Boeing is currently conducting tests on both a bimetallic cast turbine wheel and an integral cast blade ring assembly. On the former type, the hub is cast around the bases of individually cast blades, while on the latter type, the blades are cast in an integral ring and the blade ring welded to a forged or cast hub. The bimetallic cast wheel shows considerable promise.

Blade failures in turbine wheels can be caused by impact with foreign particles going through the wheel, by fatigue or by thermal shock. Pursuit of materials showing maximum resistance to these conditions of stress is constantly under way through nation-wide programs of research and testing.

The main turbine shafts on the Boeing engine are fabricated from S.A.E. 4140 steel, heat treated to 150,000 to 170,000 psi. All the gears in the reduction unit are case hardened for maximum service life, using S.A.E. 3310, 4620, and nitralloy. Extensive use of sleeve bearings throughout the engine has met considerable success. Continuous cast leaded bronze, steel-backed copper-lead, and babbitt-coated aluminum bearings are currently being utilized.

All turbine blades and turbine wheel assemblies are intensively inspected by X-ray and Zyglo throughout fabrication. Turbine wheel hub forgings are inspected by ultrasonic and Zyglo methods. The shape and nature of the impeller forging are such that ultrasonic inspection is not reliable; however, the impeller is inspected by Zyglo at various stages during machining. A final quality check on each impeller and turbine wheel assembly is afforded by a 25% overspeed proof spin in a spin pit at room temperature, followed by Zyglo and X-ray inspection of each component. All highly stressed magnetic parts are subjected to complete magnaflux testing, and X-ray and Zyglo control is exercised over all light-alloy castings.

Reliability of the Model 502 gas turbine was recently demonstrated by successful completion of a 550-hr. cycle test and continuous endurance operation. This time included 400 hr. operation at rated speed and power output. All major components, except the burner liners, completed this test without replacement or overhaul. The original burner liners were replaced after 300 hr., because of excessive warpage that could not be satisfactorily repaired.

Following Mr. Slosson's talk, a motion picture was presented showing manufacture of the Boeing turbine and also its application as a power plant in both a heavy-duty truck and a U.S.N. personnel boat.

Boston Chairmen

Horace Ross of Henry Disston & Sons, Inc. (Left), of the Boston Chapter Receives His Past Chairman's Certificate from Peter R. Kosting of Watertown Arsenal, Current Chairman. (Photo by H. L. Phillips)

Engineering Research Defined

A comprehensive definition of the role of research in engineering education, compiled by representatives of 83 leading engineering schools, is the central theme of "Research is Learning," new nontechnical publication of the Engineering College Research Council of the American Society for Engineering Education.

Associated with this 32-page illustrated publication are 12 brief summaries of universities' research activities in a wide variety of technical fields, which are designed to provide specific examples of the more general statements.

Copies of "Research is Learning" are available without cost on request to the secretary of the Engineering College Research Council, Room 7-204, 77 Massachusetts Avenue, Cambridge 39, Mass.

Eight Forms of Corrosion Explained and Illustrated

Reported by James H. Brown
Metallurgist, Ritter Co., Inc.

Although corrosion falls into two general classes, wet and dry, it may take eight different forms as manifested by visual means, Mars G. Fontana explained before the Dec. 11th meeting of the Rochester Chapter A.S.M. Professor Fontana, who is chairman of the department of metallurgy of Ohio State University, defined corrosion as the destruction of metal by chemical or electrochemical attack by environment.

Dr. Fontana then proceeded to explain the eight types in turn—namely, uniform corrosion, galvanic corrosion, concentration-cell corrosion, "catastrophic" oxidation, dezincification, stress-corrosion, intergranular corrosion and erosion-corrosion. Much of the information in his talk was presented in a series of articles in *Metal Progress* in 1948 (February, March, May and June issues).

All of the types of corrosion mentioned were illustrated by slides of actual plant failures.

As an interesting coffee talk, Herb Sommer, a native of Germany at present a student in the Colgate Rochester Divinity School, told his impressions of the United States.

Shows How Tungsten Carbide Combats Wear in Industry

Reported by James L. Foster
Metallurgist, Wheel & Brake Division
Goodyear Aircraft Corp.

The New Year was ushered in for Akron Chapter with a fine talk by Roy D. Haworth, Jr., of Allegheny Ludlum Steel Corp. on "Wear and Tungsten Carbide". Mr. Haworth, who is well fortified with both research and actual experience in this field, showed slides and a movie on sintered tungsten carbide manufacture to round out a most interesting evening.

The word "wear" signifies losses to industry that run into many millions of dollars each year, he pointed out. To combat this, laboratory machines built to simulate field wear conditions are used to explore the basic causes of wear. It is necessary that these laboratory test results correlate well with experience in the field.

Until the advent of sintered carbides, the best steel for all-around wear resistance was the 12% Cr, 2.25% C toolsteel. This grade, to give best results, is heat treated and drawn to Rockwell C-63 to 66.

When first introduced in this country in 1927, carbide tools were very expensive—as high as $1 a gram. Through constant research and increased production this figure has been steadily reduced to the present base price of about 5½¢ per gram.

In certain types of service where wear only is a problem, straight tungsten carbide is used, while for cutting tools tungsten carbide is compounded with both titanium and tantalum carbides for increased resistance to cratering.

Mr. Haworth cited the use of tungsten carbide for blanking and drawing dies where high production with minimum downtime for repairs is required. Improvement in performance 15 to 25 times over that of high-carbon high-chromium toolsteel dies of similar construction can be expected with carbide.

Unusual uses for carbides include slitting rolls in the paper and steel industries; seaming rolls in the manufacture of kitchen utensils; mining equipment such as undercutter tools, rock bits, and coal augers; and pulverizer hammers. Each day appears to unfold new uses for carbide in all phases of industry, Mr. Haworth concluded.

Prior to the talk, a fine description of "things to come" with the atom bomb was given by A. C. Wolfe of Akron University. His coffee talk was entitled "Effect of Radiation on Tissues".

Graham Presents Carnegie Lecture

E. G. Hill (Left), Director of Metallurgy and Development for Wheeling Steel Corp., Served as Technical Chairman When H. W. Graham (Center), Vice-President and Director of Technology, Jones and Laughlin Steel Corp., Presented the Third Annual Carnegie Lecture Before the Pittsburgh Chapter. At right is A. B. Wilder, chapter chairman

Reported by Shadburn Marshall
Research Associate, U. S. Steel Co.

The Third Andrew Carnegie Lecture was presented before the Pittsburgh Chapter A.S.M. on Jan. 11 by H. W. Graham, vice-president and director of technology, Jones and Laughlin Steel Corp. Mr. Graham chose as his subject "Raw Materials Quality as Affecting Iron and Steelmaking". E. G. Hill, director of metallurgy and development, Wheeling Steel Corp., served as technical chairman.

The speaker outlined the progress that has been made in steelmaking in the last half-century with particular reference to the evolution of metallurgical control. The early twenties saw a significant increase in useful information with regard to the chemical compositon of steel. Before 1930 active efforts were made to gain knowledge of aging, cold work embrittlement and other phenomena of physical metallurgy.

As to iron ore supplies, Mr. Graham listed the locations of the principal deposits, and stated that the problem of transportation must be considered in the economic use of foreign ore supplies. The progressive shrinkage in high-grade raw materials in this country has presented the problem of economically utilizing lower quality materials.

Mr. Graham stressed the principal factors which determine whether or not a given element present in raw materials will report in the pig iron or the finished steel. The most important of these factors is the relative stability of the metallic oxide as compared to that of iron oxide. To illustrate this point the speaker prepared an interesting grouping of the elements as follows:

Group I—Those elements which have lower oxide stability than iron and hence are reduced in the blast furnace and not subsequently reoxidized in the openhearth process. These are molybdenum, cobalt, tungsten, copper, nickel and tin.

Group II—Those elements which have a slightly higher oxide stability than does iron and are partially reduced in the blast furnace followed by partial oxidation in the openhearth. Unfortunately, the oxides of these elements have an unfavorable influence on slag properties. They are chromium, manganese, vanadium, and titanium.

Group III—Those elements of high oxide stability which are not reduced in the blast furnace and consequently do not enter the openhearth, such as zirconium, aluminum, magnesium, barium and calcium.

Group IV.—Those elements which have peculiar behavior when considered from the standpoint of oxide stability such as phosphorus, carbon, antimony, sulphur, and arsenic.

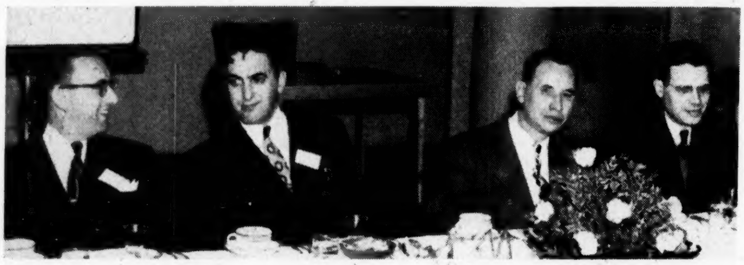
Mr. Graham pointed out that in some instances this grouping conforms with the position of the elements in the periodic table with respect to iron.

Aluminum Trends Noted

Reported by J. F. Handler
Bulova Watch Co.

A. H. Dix, Jr., assistant director of research, Aluminum Co. of America, spoke at the January meeting of the New York Chapter A.S.M. on "New Applications and Developments in Aluminum Alloys." Dr. Dix's talk has previously been reported (see *Metals Review*, December 1950, page 19, and February 1951, page 17).

Bessemer and O. H. Steelmaking Covered



At a Meeting of the Mahoning Valley Chapter Devoted to Steelmaking Are (Left to Right): John E. Stukel of Youngstown Sheet and Tube Co., Technical Chairman of the Program; Michael Tenenbaum of Inland Steel Co., the Principal Speaker; Harold H. Johnson of National Malleable and Steel Castings Co., Chapter Chairman; and A. B. Wilder of National Tube Co., Who Presented the Coffee Talk (Photograph by Henry Holberson)

Reported by Eugene M. Smith
Flat Rolled Products Development Engr.
Youngstown Sheet and Tube Co.

Both bessemer and openhearth steelmaking methods were presented at the Jan. 9th meeting of the Mahoning Valley Chapter A.S.M.

Recent bessemer installations at the Lorain Works of National Tube Co. were described in an excellently illustrated coffee talk by Arthur B. Wilder, chief metallurgist for National Tube in Pittsburgh. Color slides depicted the production of deoxidized bessemer steel and also the new blooming mill and the fabrication of seamless tubes.

Technical Chairman John Stukel, development engineer, Youngstown Sheet and Tube Co., then introduced Michael Tenenbaum, control metallurgist, Inland Steel Co., for the principal speech of the evening. His subject was "Quality Control of Openhearth Production."

Quality control can provide the maximum production of acceptable product, Dr. Tenenbaum stated. In the openhearth, emphasis is directed to control of such variables as phosphorus, sulphur, temperature, chemical analysis, deoxidation, and ingot structure.

The openhearth provides a very efficient process for removing phosphorus. Sulphur control is somewhat more troublesome. Both are controlled primarily through control of slag basicity. The lime-silica ratio provides the main mechanism for slag control. In addition to slag pancake tests, spectrographic analysis is proving helpful in maintaining the desired basicity. Graphs illustrated the change in weight of phosphorus and sulphur in the metal and in the slag at various intervals after the meltdown period.

For controlling temperature both platinum, platinum-rhodium thermocouples and immersion pyrometers are popular. It can be demonstrated that ladle skull performance and steel quality will both be improved with proper use of temperature control.

Investigation of the distribution of elements from top to bottom in the openhearth bath before deoxidation has indicated that uniformity is the common experience on the higher carbon heats. With low-carbon heats similar conditions prevail except that oxygen tends to be slightly higher toward the bath surface. Slides were presented to show that even with silicon bath deoxidation most of the oxygen is removed through reaction with carbon and that the final oxygen content of the bath is a function of bath carbon content.

Slides illustrated the effect of oxygen content on the presence and location of blowholes in solidified ingots.

During the evening 16 members were given certificates for completing a chapter-sponsored educational lecture series. This program, organized by James E. Phillips, chief metallurgist of Cold Metal Products, consisted of six biweekly lectures on "Crystallization, Its Effects and Control." Lecturers, selected from the local membership, included D. E. Babcock, J. E. Stukel, W. J. Baumgarten, J. G. Cotton, E. E. Gregg, and Edward Nelson.

Gonser Gives Titanium Talk

Reported by R. J. Wagner
Gary Screw and Bolt Division

The development of titanium as used in the metal industry today was traced for the Calumet Chapter A.S.M. on Jan. 9 by Bruce W. Gonser of Battelle Memorial Institute. The talk was similar to that presented by Dr. Gonser before the Notre Dame Chapter in the fall, reported in January *Metals Review* page 10.

Added entertainment was provided for the Calumet Chapter in the form of a movie of Sun Valley.

Electronic Controls for Spot Welding Machine Broaden Its Application

Reported by J. W. Haupt
Cardwell Mfg. Co., Inc.

After giving a short history of the development of "Resistance Welding," William J. Farrell, chief application engineer for Sciaky Bros., Inc., concentrated most of his attention on the commonest type of resistance welding, namely, spot welding. Mr. Farrell was the principal speaker before the Wichita Chapter A.S.M. on Jan. 16.

Since the application of electronic controls to spot welding machines, great flexibility is possible in adapting the machine to various types of joints, Mr. Farrell said. The welding cycle often consists of four components: preheat, weld current, quench time and post-heat treatment.

One of the most interesting applications of spot welding now being developed is in the manufacture of automotive wheels. Spot welded wheels are less expensive and stronger than the conventional riveted type. They are welded in automatic machines that produce up to 750 wheels per hour.

Projection welding, another variety of resistance welding, utilizes deformation in the material to determine the size and shape of the weld, Mr. Farrell explained. Seam welding is accomplished by circular electrodes that rotate and move the material along, producing a series of overlapping spot welds. After an explanation of flash-butt welding, a question-and-answer period was held.

Preceding Mr. Farrell's address, a coffee talk was given by J. E. Ebinger, vice-president of the Wichita Transportation Co. Mr. Ebinger discussed the conversion of city buses to propane fuel. In addition to its economy, propane will probably be in plentiful supply for some years to come. Although the liquid propane must be confined in tanks at approximately 200 psi. pressure, with proper handling it is considered safer than gasoline. It has an octane rating of approximately 120, burns cleanly, and the exhaust does not contain carbon monoxide.

Quality Control Course Offered

The College of Engineering at the University of Colorado will conduct an intensive training course in "Statistical Quality Control" from June 19 to 29. The course will include acceptance sampling and other industrial statistical methods used in industry. Applications or further information may be obtained from John F. Wagner, assistant professor of applied mathematics, College of Engineering, University of Colorado, Boulder, Colo.

Rolling and Pressing Triples Production of High-Quality Forgings

Reported by Howard E. Boyer
Chief Metallurgist, American Bosch Corp.

A means of producing higher quality forgings at lower cost compared to the older board-hammer methods is provided by equipment described for the Springfield Chapter A.S.M. at the January meeting. These machines, known as the "Reduceroll" and the "Maxipres", are manufactured by National Machinery Co., Tiffin, Ohio. R. G. Friedman, vice-president in charge of engineering, was the speaker. His presentation of "Latest Developments in Forging" was aided by moving pictures of forging operations.

Cost reduction begins with an appreciable saving in material with the use of the Reduceroll, because the forging is roughly formed prior to being placed in the dies. A step toward higher quality also starts with this operation because this rolling operation serves as an excellent descaler.

The Reduceroll uses low-cost, quickly interchangeable rolls. No operating skill is required. The machine is portable and can be used anywhere in the forge shop. It saves wear and tear on more expensive forging equipment, which formerly had to devote considerable time to preforming the blank.

The next step in economy is provided by the speed with which forgings can be finished in the "Maxipres". Mr. Friedman cited examples of forgings that could be pressed in three strokes as against many more blows required in a drop hammer.

Since the forging is roughed out prior to the pressing operation, flash is held at a minimum and is thin and uniform. Increased die life and the use of simpler dies also contribute to decrease in cost.

In many instances the number of pieces per hour can be tripled by rolling and pressing as compared to drop-hammer methods, Mr. Friedman stated. Quality is also improved because rolling prior to pressing gives better control of flow lines and higher mechanical properties.

Harvey Irving, Secretary of New Haven Chapter, Dies

Harvey C. Irving, secretary of the New Haven Chapter A.S.M., died at his home in Stratford, Conn., on Feb. first after a short illness.

H. C. Irving

He was associated with the Bridgeport Brass Co. since 1941, and was in charge of tools and toolsteels. He had previously been connected with the Coulter and McKenzie Machine Co. and the Automatic Machine Co. of Bridgeport, where he was actively concerned with the development and sales of machine tools and automatic machines. He was a graduate of Worcester Polytechnic Institute, class of 1909, in mechanical engineering.

Mr. Irving had been secretary of the New Haven Chapter since 1944, and was very active in A.S.M. affairs. His death is a great loss to his many friends and to the Society.

Worcester Hears Plating Specialist

Leaders at the January Joint Meeting of the Worcester Chapters of A.S.M. and the American Society of Tool Engineers, Were (From Left): Robert S. Morrow of George F. Blake, Inc., A.S.M. Chapter Chairman; George W. Coleman of Parker Mfg. Co., Technical Chairman of the Meeting; Carroll L. Morse of Heald Machine Co., A.S.T.E. Chapter Chairman; and Bruce E. Warner, Vice-President and General Manager of the New England Plating Co., Inc., Who Spoke on "Surface Protection of Metals" (Photograph by C. Weston Russell)

Hot Spot Machining Removes Metal At Increased Rates

Reported by Roy C. Raymond
Singer Manufacturing Co.

"Hot Spot Machining" as defined by Sam Tour, general manager, Sam Tour & Co., Inc., in a talk before the New Haven Chapter A.S.M. on Jan. 18, consists of heating only the material immediately in front of a cutting tool to obtain the beneficial results ascribed to this process.

According to the speaker, efforts have usually been concentrated on cooling the work and tools in order to increase metal removal rate and increase tool life. The hot spot machining process goes in the opposite direction and takes advantage of lower physical properties of materials at elevated temperatures. These lower physical properties are reflected in lower tool pressures. Since tool pressure is dependent on width and depth of cut, heavier cuts may be taken.

The work is heated by flame or induction methods on a narrow band just ahead of the cutting tool. The centers of the lathe and ends of the work are cooled. One advantage of induction heating is that only a ½-in. band of work is heated, compared with a 1-in. band in flame heating. Temperature differential in the work itself is such that if the surface is heated to 1500° F., the point of tool-tip contact may be 1100° F. and the body of the work around 500° F.

Tool pressure decreases markedly with advance in temperature of the material being machined. Temperatures in use range from 500 to 1600° F., depending on the material and effect desired. Greater benefits are obtained at the higher temperatures, particularly if the chip temperatures are 300 to 400° F. higher than the temperature of the work.

Micrographs of the work machined showed a smoother surface as compared with conventional machining. Accuracy can be held to within 0.0015 in. on a 3-in. bar using heavy cuts up to 5/16 in. deep.

Disadvantages of the process include increased power consumption to heat the work, and difficult chip disposal, since the chips usually come off in the form of a red-hot continuous ribbon.

Advantages include metal removal at rates several times faster than at room temperature, and the ability to machine highly alloyed steels which are very difficult or almost impossible to machine at room temperature.

The feasibility of using hot spot machining, according to Mr. Tour, will depend on whether the increased cost of power and equipment may be more than compensated for by the saving in man and machine-hours.

Laboratory Abrasion Test Ranks Alloys

At the January Joint Meeting of the Texas Chapters of A.S.M. and A.S.T.E. Are (Left to Right): Wm. C. George, Sales Engineer, American Brake Shoe Co.; Howard S. Avery, Research Metallurgist, American Brake Shoe Co., the Speaker; and Harold W. Schmid, Vice-President of General Metals Corp. and A.S.M. Chairman. (Photograph by Leland V. Dolan)

Reported by W. Mack Crook
Consulting Engineer

"Abrasion is a type of wear associated with scratching by hard particles and complicated by various stress concentrations. Abrasion resistance is supplied by hardness, but toughness is also required in varying degrees. Quantitative evaluation of required toughness is often difficult."

With these clarifying introductory remarks, Howard S. Avery, research metallurgist, American Brake Shoe Co., proceeded to speak on "Abrasion Resistant Alloys" before the Texas Chapter A.S.M. on Jan. 9. The occasion marked a joint meeting with the local group in Houston of the American Society of Tool Engineers.

The useful abrasion resistant alloys are those that provide a graded scale of hardness, toughness, and associaed properties, the speaker continued. When abrasion is associated with heat, corrosion, vibration, or other factors, additional chemical and physical properties become important, such as the contribution of chromium to scaling resistance.

Mr. Avery then listed seven abrasion resistant alloys that constitute an industrially proven group. These are tungsten carbide, 26% Cr iron, martensitic iron, Cr-Co-W alloys, martensitic steels, pearlitic steels, and austenitic manganese steel.

To properly rank alloys for selection purposes requires both laboratory and field tests in adequate variety. This is a field of continuing research, Mr. Avery stated. Field tests are frequently unreliable, but should generally be valid. Laboratory tests can be made reliable, but must have validity demonstrated by correlation with reliable field tests. This is a serious problem.

Mr. Avery then described a laboratory abrasion test program for ranking of various alloys. Results are expressed as an abrasion factor representing weight loss as compared to weight loss of S.A.E. 1020 steel. The validity of the test is determined by correlation with ball mill service field tests. The test takes into account such variables as stress, abrasive fineness, abrasive fracture, and abrasive hardness.

Will Serve as Consultant

Marshall H. Medwedeff, metallurgist for many years with A. C. Spark Plug Division of General Motors Corp., has retired and will henceforth engage in private consulting practice. He has been a member of A.S.M. since 1917, and was a charter member of the Buffalo Chapter. His address is 2201 Bagley St., Flint, Mich.

Technical Papers Invited

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1952 *Transactions*. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the society. Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 33rd National Metal Congress and Exposition to be held in Detroit, Oct. 15 to 19, 1951. Papers that are selected for presentation at the Convention will be preprinted and manuscripts should be received at A.S.M. headquarters office not later than April 10, 1951.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

Use of Diesels Increases In Canadian Railroads

Reported by John Bradbury
Metallographer
Algoma Steel Corp., Ltd.

The Northern Ontario Chapter A.S.M. (not Northern Ohio, as reported in the December issue of *Metals Review*)* held its regular monthly dinner meeting on Jan. 17, with J. "Mike" Kelly, division freight agent for the Canadian Pacific Railway at North Bay, Ont., as guest speaker. Mr. Kelly spoke on "Diesel Engines in Railroading". A General Motors film on diesels was shown as a background for the talk.

The diesel engine is the modern trend in the North country, Mr. Kelly said. This he attributed to the increased price of coal, poorer grades, coal strikes, decreased maintenance costs for diesel engines, availability of oil, and better operating conditions.

The Ontario Northland Railway is the first all-diesel railway in Canada. The Algoma Central and Hudson Bay Railway will have six diesels in operation shortly. Algoma Steel Corp. has 13 units in operation. The Canadian Pacific Railway has 62 units operating west of Sudbury, Algoma District to Fort William.

Mr. Kelly said that experimental work is under way on the manufacture of melodious horns to replace the unpleasant fog horn now in use.

Morral Goes With Kaiser

F. R. Morral has resigned as associate professor of materials engineering at Syracuse University to take a position as head of the X-ray diffraction department in the division of metallurgical research of Kaiser Aluminum and Chemical Corp. in Spokane, Wash. Dr. Morral has been serving as *Metals Review* reporter for the Syracuse Chapter for the past two years.

Dr. Morral studied at M.I.T. and Purdue University in the United States, and at Barcelona, Spain, and the Metalografiska Institute, Stockholm. He was formerly a group leader of the metal trades laboratory for American Cyanamid Co.

*Sorry—Ed.

Outlines Development of Gas Turbines and Jets

Reported by Kenneth B. Lloyd

Research Metallurgist
University of California

The timely subject of "Gas Turbines and Jet Propulsion", as presented by John M. Dodds of General Electric Co., consultant on special problems, shared the attention of the Golden Gate Chapter members at the Dec. 11th meeting, with Bill Eisenman's progress report on the 1951 Western Metal Exposition.

Technical Chairman Earl R. Parker, a former G.E. research worker and now professor of metallurgy at University of California, introduced the speaker and gave a sparkling explanation of the adoption by G.E. of the dentist's Vitallium as a high-temperature alloy during his association with the company. Mr. Dodds revealed that similar alloys are widely used in gas turbines despite their high cost.

The development of gas turbines by General Electric from the principles of the rotary compressor worked out in the early years of the century, on through the first war to a patentable machine in 1940 was traced by the speaker. This machine was sidetracked for expediency and the jet engine of the Briton, Whittle, was then further developed for war service.

The engineering principles of jet propulsion, the comparative efficiencies of the jet and turbo-prop-jet with reciprocating engines for various applications, and the continuing need for metals to perform adequately at the extreme temperatures, were all outlined during the talk and the attendant question period.

Bill Eisenman, national A.S.M. secretary, who has become a Californian for the winter, was introduced by Harry E. Lewis, head of Pyromet Brazing and Heat Treating Co., the Golden Gate Chapter chairman. The plans and the theme "Production for America" of the coming Western Metal Exposition were enthusiastically received by the chapter members present.

Die-Casting Award Entries Open

Nominations or entries for the annual Doehler Award sponsored by the American Die Casting Institute are now being solicited. Nominations will be received between Jan. 1 and April 30.

The award is made for outstanding contributions to the advancement of the die-casting industry and process, as represented by technical achievement, advancements in plant operations, or other activities in this field. Any individual, group of individuals, technical or scientific society or committee is eligible for the award, which consists of a suitable plaque and a cash honorarium of at least $500.

Entries should be addressed to Award Committee, American Die Casting Institute, 366 Madison Ave., New York 17, N. Y.

Welding Fellowships Announced

The Welding Research Council of the Engineering Foundation is administering, under its University Research Committee, predoctoral research fellowships in applied sciences related to welding. The fellowships are supported by the International Harvester Co., Chicago Bridge & Iron Co., Linde Air Products Co., and others. Any university desiring to apply for one of these fellowships should indicate the type of problem which the university wishes to undertake, the name of the faculty advisor, and a biographical sketch and complete information in regard to candidates.

The Plasticity Committee of the Council is also creating two fellowships for predoctoral or postdoctoral work.

Inquiries and applications should be sent to W. Spraragen, director, Welding Research Council, 29 West 39th St., New York 18, N. Y., not later than June 1, 1951.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	Apr. 11		Ralph L. Wilson	Applications of Alloy Steels
Baltimore	Apr. 16	Engineers Club	O. J. Horger	What the Metallurgist Should Know About Design
Boston	Apr. 6	Shelton Hotel	W. G. Theisinger	Sauveur Lecture
British Columbia	Apr. 12			Field Trip
Calumet	Apr.	Phil Smidts, Hammond Ind.	M. F. Yarotsky	Open Hearth Pit Practice
Canton-Massillon	Apr. 9	Mergus Restaurant	Leo P. Tarasov	Metallurgical Problems in Grinding
Chicago	Apr. 9	Furniture Club	V. N. Krivobok	Current Developments in Stainless Steel
Cincinnati	Apr. 12	Engineering Society Tri-Chapter Meeting		Working of Metals
Cleveland	Apr. 2	Tudor Arms Hotel	Blake Crider	(Ladies Night) Emotional Aspects of Living
Columbus	Apr. 12	Tri-Chapter Meeting in Cincinnati		Working of Metals
Dayton	Apr. 12	Tri-Chapter Meeting in Cincinnati		Working of Metals
Des Moines	Apr. 10	Younker's Tearoom		Fluid Flow in Transparent Molds
Detroit	Apr. 9	Rackham Bldg.	R. H. Harrington	Alloying as a Science
Eastern N. Y.	Apr. 10	Circle Inn	C. D. Moriarty	Nondestructive Testing in Manufacture of Turbines
Fort Wayne	Apr. 10	Chamber of Commerce	J. J. Bowden	Mill Practice, Carbon Steel Sheet and Strip
Hartford	Apr. 10	Royal Typewriter Co.		Plant Visitation
Kansas City	Apr. 18	Fred Harvey Pine Room	C. B. Minnich	Industrial Radiography
Lehigh Valley	Apr. 6	Hotel Bethlehem	B. W. Gonser	Unusual Metals
Los Alamos	Apr. 21	Los Alamos High School Auditorium	A. B. Kinzel	
Los Angeles	Apr.	Rodger Young Audit.	R. David Thomas	New Developments in Welding Alloy Steels
Louisville	Apr. 3	Kapfhammer's Party House	H. H. Harris	High-Temperature Alloys
Mahoning Valley	Apr. 10	Post Room, V.F.W.	Sam Epstein	Metallurgical Aspects of Deep Drawing Steel
Milwaukee	Apr. 17	City Club	G. E. Linnert	Recent Developments in Welding Stainless and Heat Resisting Steels
Montreal	Apr. 2	Queen's Hotel	J. W. Lengbridge	Metal Flow in Deep Drawing Operations on Aluminum
Muncie	Apr. 10			Plant Tours
New Haven	Apr. 19	Hotel Elton, Waterbury	Leo P. Tarasov	Metallurgical Aids to Better Grinding
New Jersey	Apr. 16	Essex House, Newark	Raymond A. Grange	Hardenability
New York	Apr. 9	2 Park Ave.	G. N. Goller	Stainless Steel
North Texas	Apr. 11	Ft. Worth		
North West	Apr. 19	Covered Wagon		To be Announced
Northern Ontario	Apr. 18	Windsor Hotel, Sault Ste. Marie	I. S. Decarie	Canada's Aluminum Industry
Northwestern Pa.	Apr. 19	Warren, Pa.	M. F. Judkins	Design of Cemented Carbide Cutting Tools
Notre Dame	Apr. 11	Engineering Bldg. University of N. D.	William L. Fink	Precipitation Hardening
Ontario	Apr. 6	Royal Connaught Hotel, Hamilton, Ont.	G. C. Monture	Strategic Materials
Ottawa Valley	Apr. 3	Mines Branch, 568 Booth St., Ottawa	J. C. Fox	Die Castings
Penn State	Apr. 10	217 Willard Hall	Russell Franks	High-Temperature Alloys
Peoria	Apr. 9	Morton Civic Bldg., Morton, Ill.	Carl A. Zapffe	Stainless Steels
Philadelphia	Apr. 27	Engineers Club	A. L. Rustay	Aircraft Forgings
Pittsburgh	Apr. 5	Crucible Steel Co., Midland, Pa.		Plant Visitation and Regional Meeting
	Apr. 12		W. L. Grube	Electron Metallography of Steel
Puget Sound	Apr. 11	Engineers Club	H. P. Rassbach	Effects of Alloying Additions to Steel
Purdue	Apr. 14	Purdue Memorial Union Bldg.		Statewide Symposium
Rhode Island	Apr. 4		M. F. Thomas	New Developments in Cutting Oils, Quenching Oils and Rust Preventives
Rochester	Apr. 9		L. F. Yntema	Commercial Applications of the Important Rarer Metals
Rockford	Apr. 25	Keystone Steel and Wire Co., Peoria, Ill.		Plant Visitation
Saginaw Valley	Apr. 17	Midland C. C.	W. T. Lankford	Fundamentals of Deep Drawing Sheet
Southern Tier	Apr. 9	Statler Hall Ithaca N. Y.	M. F. Garwood	Metallurgical Case Histories
St. Louis	Apr. 20	Alton, Ill.		
Springfield	Apr. 16	Bernardston Inn, Bernardston, Mass.	Stewart Fletcher	High Speed Steels
Terre Haute	Apr. 2	Indiana State Teachers College Student Union	C. R. Austin	Foundry

Texas	**Apr. 3**	Ben Milam Hotel, Houston	**O. J. Horger**	Relationship of Metallurgy and Design
Toledo	**Apr. 19**	Maumee River Yacht Club	**Walter Cheney and W. C. Hiatt**	Mass Marquenching
Tri-City	**Apr. 3**	Rock Island Arsenal	**P. V. Farragher**	The Place of Aluminum as an Engineering Material
Tulsa	**Apr. 9**		**John W. Sands**	The Influence of Chemical Composition and Microstructure on the Mechanical Properties and Hardenability of Engineering Alloy Steels
Warren	**Apr. 12**			Fuels and Furnaces for Rolling, Forging and Heat Treating
			Robert E. Buckholdt	Oil-Fired Furnaces
			John W. Townsend	Gas-Fired Furnaces
			E. T. Trebilcock	Electric Furnaces
Washington	**Apr. 13**	Pepco Auditorium		Ladies Night
West Michigan	**Apr. 16**	Nash-Kelvinator Corp. Grand Rapids, Mich.		Plant Tour
Worcester	**Apr. 11**	Simonds Saw and Steel Co., Fitchburg		Visitation
York	**Apr. 11**	Gettysburg	**J. Vilella**	Metallographic Techniques

Tri-Chapter Meeting to Be In Cincinnati April 12

Reported by Marvin L. Steinbuch
Lunkenheimer Co.

The 11th annual Tri-Chapter meeting of the Columbus, Dayton and Cincinnati Chapters of A.S.M. will be held in Cincinnati on April 12. The program will include four talks on the general topic of "Working of Metals". Speakers and subjects are as follows:

Effect of Steel Mill Practice on Customers' Requirements, by C. L. Altenburger, research engineer, Great Lakes Steel Corp.

Drawing and Stamping of Iron and Steel Sheets, by R. S. Burns, associate director of research laboratories, Armco Steel Corp.

New Developments in the Forging of Light Alloys, by A. J. Pepin, quality and research engineer, Wyman Gordon Co.

A New Approach to Machinability Through Microstructure, by Michael Field, partner, Metcut Research Associates.

A.S.M. National President Walter Jominy will aid Russell Hastings, Cincinnati Chapter chairman, in the introductions as well as in presenting the summary. The coffee talk will be provided by the inimitable Bill Dern under the title "Humor Is Where You Find It".

Nodular Iron Seen as Subsitute for Cast Steel

Reported by W. B. Moore
Technical Service Engineer
Reynolds Metals Co.

Speaking on "Nodular Iron" before the January meeting of the Louisville Chapter A.S.M., C. O. Burgess, technical director of the Gray Iron Founders Society, Inc., prefaced his remarks with a general description of this new material. Slides were shown illustrating that nodular iron castings can be made with higher strength and ductility than gray iron. These properties, in fact, are only slightly lower than for cast steel.

Among the various methods of producing nodular iron, magnesium and cerium are the two materials most commonly used, Dr. Burgess pointed out. Many different alloys are used to introduce magnesium into the melt, as well as different methods of introduction, care always being taken to prevent explosions.

Dr. Burgess feels that nodular iron's primary applications will be as a substitute for cast steel rather than for gray or malleable iron. The development is still in its infancy, but daily progress is being made in the perfection of this new engineering material.

IMPORTANT MEETINGS FOR APRIL

April 2-4—American Institute of Mining and Metallurgical Engineers. Openhearth and Blast Furnace, Coke Oven and Raw Materials Conference, Hotel Statler, Cleveland. (E. O. Kirkendall, secretary, Metals Branch, A.I.M.E., 29 West 39th St., New York 18.)

April 2-5—American Society of Mechanical Engineers. Spring Meeting, Atlanta Biltmore Hotel, Atlanta, Ga. (Ernest Hartford, executive assistant secretary, A.S.M.E., 29 West 39th St., New York 18.)

April 3—Society for Applied Spectroscopy. Meeting on Spectrochemical Methods in Ferrous Metallurgy. (C. A. Jedlicka, secretary, S.A.S., c/o Lucius Pitkin, Inc., 47 Fulton St., New York 7.)

April 4-6—14th Annual Midwest Power Conference, Sherman Hotel, Chicago. Sponsored by Illinois Institute of Technology and 18 midwestern universities and professional societies. (Roland A. Budenholzer, director of the conference, professor of mechanical engineering, Illinois Institute of Technology, Technology Center, Chicago 16.)

April 8-11—Electrochemical Society. Spring Meeting, Wardman Park Hotel, Washington, D. C. (H. B. Linford, secretary, 235 West 102nd St., New York 25.)

April 9-10—American Institute of Steel Construction. Spring Engineering Conference, Hotel William Penn, Pittsburgh. (L. Abbett Post, executive vice-president, A.I.S.C., 101 Park Ave., New York City.)

April 15-18 — Scientific Apparatus Makers Association. 33rd Annual Meeting, Greenbrier Hotel, White Sulphur Springs, West Va. (Kenneth Andersen, executive vice-president, S.A.M.A., 20 North Wacker Dr., Chicago 6.)

April 16-18 — American Society of Lubrication Engineers. National Convention and Annual Lubrication Show, Bellevue-Stratford Hotel, Philadelphia. (W. F. Leonard, secretary, A.S.L.E., 343 South Dearborn St., Chicago 4.)

April 16-18—American Gas Association. Distribution, Motor Vehicle and Corrosion Conference, Hotel Peabody, Memphis, Tenn. (M. A. Combs, secretary, A.G.A., 420 Lexington Ave., New York 17.)

April 16-18—Society of Automotive Engineers. Aeronautic Meeting and Aircraft Engineering Display, Hotel Statler, New York. (John A. C. Warner, secretary and general manager, S.A.E., 29 West 39th St., New York 18.)

April 17-20—American Management Association. National Packaging Exposition, Auditorium, Atlantic City, N. J. (James O. Rice, secretary, A.M.A., 330 West 42nd St., New York 18.)

April 20-21 — Colorado School of Mines. 17th Annual Engineers' Day, Golden, Colo. (Roger A. Richter, C.S.M., Golden, Colo.)

April 23-26—American Foundrymen's Society. 55th Annual Convention, Buffalo, N. Y. (Wm. W. Maloney, secretary-treasurer, A.F.S., 616 South Michigan Ave., Chicago 5.)

April 25-26—Metal Powder Association. Seventh Annual Meeting and Metal Powder Show, Hotel Cleveland, Cleveland Ohio. (Robert L. Ziegfeld, acting secretary, M. P. A., 420 Lexington Ave., New York 17.)

April 30-May 1—Association of Iron and Steel Engineers. Spring Conference, Detroit. (T. J. Ess, managing director, A.I.S.E., Empire Bldg., Pittsburgh 22.)

April 30-May 4—American Material Handling Society and Material Handling Institute. Materials Handling Conference and Fourth National Materials Handling Exposition, International Amphitheatre, Chicago. (Clapp and Poliak, Inc., 341 Madison Ave., New York 17.)

A. S. M. Members' Names Added to Quarter-Century Club Roster

The following A.S.M. members have been awarded honorary certificates commemorating 25 years' consecutive membership in the Society:

Canton-Massillon Chapter — W. G. Bischoff, Claude L. Clark, John E. Fick, Frederick J. Griffiths, Edgar K. Mull, E. C. Roglin, D. H. Ruhnke, M. H. Schmid, Gordon A. Stumpf, R. W. Thompson, James C. Vignos, Walter M. Wilkoff. Sustaining Membership: Union Drawn Steel Div. of Republic Steel Corp.

Chicago Chapter—A. Allan Bates, E. J. Carlson, Joseph H. Clark, John R. Daesen, H. W. Maack, Joseph J. Polivka, R. J. Portmann, Charles E. Reardon, Harry E. Rogers, Robert M. Sandberg, A. J. Scheid, Jr., W. F. Schroeder, S. H. Steffensen, James D. White. Sustaining Memberships: Crucible Steel Co of America and Danly Machine Specialties, Inc.

Cincinnati Chapter — Russel W. Chiodo, W. J. Frederick, Roy O. McDuffie, N. C. Strohmenger. Sustaining Membership: Columbia Tool Steel Co.

Columbus Chapter—L. H. Marshall Co.

Detroit Chapter—A. L. Boegehold, Orlan W. Boston, Edwin A. Brophy, Hale A. Clark, George D. Johnston, E. L. Knapp, C. W. Lighthall, Clarence J. Tobin, J. S. Voight, Raymond J. Wilcox, Frederick C. Young.

Eastern New York Chapter—Leroy L. Wyman.

Fort Wayne Chapter—W. E. McGahey.

Golden Gate Chapter—Sustaining Memberships: American Can Co., Caterpillar Tractor Co., Hall-Scott Motor Div. of ACF-Brill Motors Co.

Hartford Chapter—Ralph F. Casella. Sustaining Membership: United Aircraft Corp.

Indianapolis Chapter—William Higburg, J. L. Schueler. Sustaining Memberships: J. D. Adams Mfg. Co., Carpenter Steel Co.

Kansas City Chapter — Milo J. Stutzman.

Lehigh Valley Chapter—Felix F. Aloi, E. Von Hambach. Sustaining Membership: Ingersoll Rand Co.

Los Angeles Chapter — Edgar Brooker, Harry F. Brown, G. L. Cheney, George N. Hawley, Robert E. Hiller, James H. Knapp, Edwin K. Smith, C. C. Snyder.

Louisville Chapter—Fred C. Smith.

Mahoning Valley Chapter — David B. Carson, Richard H. Eurich, E. J. P. Fisher, C. W. Weesner.

Milwaukee Chapter—Elmer Gammeter, I. F. Herbes, C. R. Prentice, J. E. Schoen, John A. Webber.

Missouri School of Mines Chapter—David F. Walsh.

North West Chapter—Edward E. Johnson, Inc.

Northwest Pennsylvania Chapter—R. C. Bovard, F. E. Whittlesey.

Notre Dame Chapter—Edward G. Mahin, J. A. White.

Ontario Chapter—Harold B. Chambers, Robert R. Deans. Sustaining Memberships: Arthur Balfour & Co., Toronto Hydro-Electric System.

Penn State Chapter—William W. Sieg.

Philadelphia Chapter—H. R. Abey, M. Elmer Bark, J. R. Baush, S. Frederick Magis, C. S. Roberts, Leon B. Rosseau, Claude L. Roth, Adolph O. Schaefer, H. R. Scott, Arnold D. Spillman. Sustaining Memberships: Henry Disston & Sons, Inc., Edgcomb Steel Co., Peter A. Frasse & Co. Inc., Alan Wood Steel Co.

West Michigan Chapter—Edward W. Bitzer, Fred Jack Dehudy, Albert W. Demmler.

Modernization of Salt Baths Solves Various Problems

Reported by Wilhelm Olson
Atwood Vacuum Machine Co.

Applications of salt bath equipment in production formed the principal theme of a talk before the Rockford Chapter in February by A. F. Holden, president of the company bearing his name. Speaking on "Modernization and Use of Salt Bath Furnaces", he did, however, include some comments concerning the salt itself.

The chief cause of trouble in salt bath heat treatment, Mr. Holden asserted, is the inadvertent introduction of alkalis and sulphur-bearing oils through improperly cleaned work. Clean salts will not cause decarburization if the heating cycle is such that carbon migration does not have time to occur. Additives are available for controlling the metallic oxide content of the bath.

Advantages of salt baths were described from the standpoint of versatility and results. Particular stress was placed on the application of mechanical handling, to which the process lends itself admirably.

Certain advantages are inherent in the process, and as an example Mr. Holden suggested the possibility of combination treatments such as stress relief and descaling. In extrusion operations, the heating speed using salt baths is so rapid that the center section of the billets is colder—hence harder—than the area nearer the surface. The resulting differential in flow properties is essential in this operation.

Other modern developments in salt bath furnaces were also described, all of which have helped eliminate the problems that formerly accompanied use of this type of equipment.

New Films

Die Casting

Entitled "The Shortest Way", a new movie on the die-casting process shows conclusively that die casting is a mass-production process. The film, which requires 27 min. for showing time, was produced by the Jam Handy Organization, and the actual filming was done in the seven plants of Doehler-Jarvis Corp. Requests for loan of the film should be made to the Doehler-Jarvis Corp., Department of Public Relations, 386 Fourth Ave., New York 16, N. Y., or to sales or plant managers for Doehler-Jarvis at Toledo, Ohio, Pottstown, Pa., Batavia, N. Y., Grand Rapids, Mich., or Chicago.

Electric Motors

"Motors on Parade" is a 16-mm. black and white, sound motion picture with a running time of 26 min. The film serves two purposes: First, to show the importance of the electric motor in the home, farm, transportation and industry, and second, to show how electric motors are made on a mass-production basis. The film was produced by the Jam Handy Organization, and may be scheduled by writing to the Public Relations Department, Delco Products Division, General Motors Corp., 329 East First St., Dayton 1, Ohio.

Trustee Speaks on Stainless

Reported by Knox A. Powell
Research Engineer
Minneapolis-Moline Co.

Elmer Gammeter, laboratory director for Globe Steel Tubes Co., spoke on "Stainless Steel" before the regular dinner meeting of the Northwest Chapter in Minneapolis on Jan. 18. He explained the outstanding characteristics of stain-resisting steel, outlined proper applications, and illustrated and discussed specific failures and their causes.

Since Mr. Gammeter, in his capacity of A.S.M. national trustee, will present his talk before a number of local chapters, it will not be reported in detail here.

New Alumina Plant Under Way

Construction has been started by Aluminum Co. of America on a new alumina plant near Bauxite, Ark. Designed to process low-grade bauxite ore, the new plant will increase by nearly 50% the amount of alumina now being produced by the company. The conversion of low-grade bauxite ores to aluminum was made possible through an Alcoa development achieved early in World War II.

Electrochemical Phenomena Explained in Talk on Chemistry of Corrosion

Reported by J. P. Simpson
Chief Chemist, Canadian Car & Foundry Co.

The "Chemistry of Corrosion" was explained by R. B. Mears of Carnegie-Illinois Steel Corp. before the Montreal Chapter A.S.M. on Feb. 5.

All of the metals and alloys in common industrial use have a tendency to combine chemically with their environment, said Dr. Mears. The free energy of formation of the appropriate corrosion product gives a measure of the driving force for the corrosion reaction. However, even when the magnitude of the driving force is known, it is impossible to calculate the actual rate of corrosion. It has been found that under many conditions of exposure, at least, the structurally serious corrosion of the common metals is associated with the flow of electric currents. That is, corrosion in aqueous media is an electrochemical phenomenon.

This being the case, if the total current associated with the corrosion reaction can be measured, the instantaneous corrosion rate can be calculated. Furthermore, potential differences between different areas on the surface of a metallic structure will indicate which areas will suffer corrosive attack, although the rate of attack cannot be obtained from such measurements alone.

Practically any inhomogeneity in a metal or alloy, in its surface condition or in its environment, can cause local differences in potential. Such factors as inclusions, grain boundaries, scratches, local differences in oxygen concentration in different volumes of a solution in contact with the metal or alloy, local differences in temperature, agitation, illumination and the like, are all effective in causing local differences in potential and consequently localized corrosion.

The means of controlling corrosion include the use of appropriate design, material selection, inhibitors, coatings and cathodic protection. Of these, appropriate design is generally the most important, since if a poor design is used it may be economically impossible to control corrosion.

Immediately before Dr. Mears's talk a preview of the United States Steel's film "Building for the Nations" was shown. This film tells the dramatic story of the fabrication and erection of the structural steelwork for the United Nations Secretariat Building. Dramatically portrayed in sound and color, it is the story of the acquisition of a crowded 17-acre site, the architectural design of the new U.N. buildings, demolition of the old, and finally erection and dedication ceremonies.

Aircraft Subcontractors Wanted

Wright Aeronautical Corp., Main & Passaic Sts., Woodridge, N. J., is looking for qualified subcontractors on government orders for aircraft engines. Most urgent requirements are for manufacturers of hardened and ground parts, fabricated sheet metal, gears, screw machine products, aluminum, magnesium and steel castings, aluminum forgings, controls and accessories, and engine subassemblies. A written statement of facilities, machine tools, equipment and capacity should be sent to the corporation.

M. I. T. Offers Analysis Courses

Two one-week specialized training programs in instrumental analysis will be offered from July 9 to 13 and July 16 to 20 as part of the 1951 summer session at the Massachusetts Institute of Technology. The first week's program will be devoted to electrical methods of instrumental analysis, and the second to optical methods. Both programs will consist of a 2-hr. period for lecture and discussion and a 3-hr. laboratory workshop each day. No academic credit will be offered. Tuition for each one-week period will be $65.

Application forms may be obtained from Prof. Walter H. Gale, Room 3-107, Massachusetts Institute of Technology, Cambridge 39, Mass.

Detroit Hears Jominy

Reported by Malcolm G. Simons
Pressed Metals of America, Inc.

National Officers' Night of the Detroit Chapter A.S.M. was held on Feb. 12. Detroit's own Walter E. Jominy, staff engineer of the Chrysler Corp. and currently national president of the Society, addressed the local membership on "Reducing Wear by Proper Metallurgy". Mr. Jominy reported the latest ideas as to manner in which wear actually occurs and the latest methods of combating such wear.

National Secretary W. H. Eisenman, who is on the West Coast preparing for the Western Metal Congress, was unable to attend this meeting. In his absence, Mr. Jominy was called upon to pinch-hit with a statistical report of the national organization.

Fisher Scientific Has New Plant

Fisher Scientific Co. has opened a new plant in Washington, D. C., which will serve as a stocking, shipping, and repair center for the Atlantic Seaboard area. The plant is located at 7722 Woodbury Drive.

Over an acre of modern shelving is available in the new air-conditioned plant to store thousands of laboratory apparatus items, instruments and chemicals. The company's main office, laboratories and manufacturing plant are in Pittsburgh.

Books for the

METAL INDUSTRY

Five important books issued in 1951. This means that you have the latest information when they are read. Top authorities, of course, and each keyed to the problems faced by the metallurgical engineer who must meet critical needs in the industry.

Atom Movements— This book contains the formal papers presented at the annual Seminar, given under the auspices of the Society, and held at the two-day meeting which preceded the 32nd National Metal Congress in 1950. Twelve of the top experts discuss such aspects of diffusion as formal basis of the theory, chemical techniques, tracer techniques, mechanisms, boundary movements, high temperatures, and internal oxidation.

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A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

W. W. Howell, Technical Abstractor

Assisted by Pauline Beinbrech, N. W. Baklanoff, Fred Rothfuss, and Leila M. Virtue

A

GENERAL METALLURGICAL

42-A. Metalworking Climbing Toward World War II Levels in 1951. *American Machinist,* v. 95, Jan. 22, 1951, p. 131-164.

Annual Metalworking Facts Section presents extensive tabular, graphical, and textual information concerning production, prices, etc. Includes guide to defense business and government procurement and list of defense-contract awards to date. (A4)

43-A. American Machinist 1951 Production Preview. *American Machinist,* v. 95, Jan. 22, 1951, p. 165-212, 215-262, 265-312.

New metalworking equipment, parts, and materials. Includes machine tools and attachments; tools and accessories; forming, forging, casting; welding and heat treating; layout and inspection; cleaning and finishing; plant service equipment; and parts and materials. (A general, G general)

44-A. Ten Years in Steel. Harry W. McQuaid. *Metal Progress,* v. 59, Jan. 1951, p. 55-57.

Economic and technical developments of the past ten years. Pig iron and scrap, economics of plant location, technical and mechanical improvements, changes in alloy steels, and the metallurgist's future. (A4, D general, ST)

45-A. The Steel Plant Laboratory; Its Function and Value. Stephen Bianco. *Western Machinery and Steel World,* v. 42, Jan. 1951, p. 82-85.

Includes details of equipment and procedure of the laboratory of Bethlehem Pacific Steel Corp.'s South San Francisco plant. (A9, ST)

46-A. Electrical and Allied Developments During 1950. Guy Bartlett. *General Electric Review,* v. 54, Jan. 1951, p. 15-60.

A survey. Applications in research (metallurgical, chemical, electronic, and nuclear); testing and measuring; power; industrial electrical equipment; transportation; electromedical; electronics; lighting; air conditioning; appliances; construction materials; chemistry; plastics; and metallurgy (including welding and miscellaneous metal-working processes). (A general)

47-A. The AEC in Solid-State Metallurgy. D. W. Lillie. *Nucleonics,* v. 8, Jan. 1951, p. 17-23.

Early in 1948, the AEC began to encourage sound proposals for metallic-state research. An integrated program was built around the resulting basic research. Examples of progress to date. (A9)

48-A. Experience With Chlorination of Cyanides in the General Motors Corporation. I. Introduction. David Milne. **II. Detroit Diesel Engine Division.** P. W. Uhl. **III. Pontiac Motor Division.** Earl J. Roy. **IV. Delco-Remy Division.** C. F. Hauri. *Sewage and Industrial Wastes,* v. 23, Jan. 1951, p. 64-81. (A8)

49-A. Review of United States 1950 Mineral Production. *Skillings' Mining Review,* v. 39, Jan. 27, 1951, p. 1, 4. (A4)

50-A. The British Iron and Steel Industry. *Engineer,* v. 191, Jan. 5, 1951, p. 17-19; Jan. 12, 1951, p. 62-64.

A review. (A4, Fe, ST)

51-A. Developments in the Iron and Steel Industry During 1950. I. E. Madsen. *Iron and Steel Engineer,* v. 28, Jan. 1951, p. 109-137.. (A general, Fe, ST)

52-A. Progress in Industry Awaits Many Developments in Engineering Materials. T. C. Du Mond. *Materials & Methods,* v. 33, Jan. 1951, p. 57-61.

Needs of industry for materials of better resistance to corrosion and to high temperatures, also other miscellaneous requirements. Need for more basic research. (A general)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

53-A. Review of Materials Engineering Developments in 1950. T. C. Du Mond. *Materials & Methods,* v. 33, Jan. 1951, p. 85-96.

Covers irons and steels; nonferrous metals; nonmetallic materials; fabricated parts and forms; finishes; heat treating; cleaning and finishing; welding and joining; testing; and inspection. (A general)

54-A. Grades of Lake Superior Iron Ore Shipped in 1950. *Skillings' Mining Review,* v. 39, Feb. 10, 1951, p. 1, 4, 6.

Tonnages from different ranges and of different grades are tabulated. (A4, Fe)

55-A. Titanium: Huge Expansion for Defense Paves Way for Civilian Uses. F. L. Church. *Modern Metals,* v. 6, Jan. 1951, p. 19-21.

Economic survey and forecast. (A4, T general, Ti)

56-A. Steel Capacity in '52 Set at Over 120 Million Tons. John Delaney. *Iron Age,* v. 167, Feb. 1, 1951, p. 121-122.

Planned-capacity data are tabulated and discussed. (A4, ST)

57-A. Iron Ore Shipments From United States Mines Will Approximate 97,000,000 Gross Tons. Verne D. Johnston. *Blast Furnace and Steel Plant,* v. 39, Jan. 1951, p. 57-62.

1950 estimates for shipments from various districts and ranges, also breakdown for method of shipment. (A4, A5, Fe)

58-A. Steel for the Expanding Industry of California. Alden G. Roach. *Blast Furnace and Steel Plant,* v. 39, Jan. 1951, p. 78-82, 84.

Expansion of California's industrial economy and supply of steel on the West Coast. Appraises demands which face the steel industry in the West and the extent to which it has expanded to meet these demands. (A4, A6)

59-A. Electric Furnace Capacity Passed 7,000,000 Tons in 1950. James A. Clark. *Blast Furnace and Steel Plant,* v. 39, Jan. 1951, p. 83-84.

Expansion in steelmaking. (A4, D5, ST)

60-A. Consumption of Metallics in 1950 Sets Record. Edwin C. Barringer. *Blast Furnace and Steel Plant,* v. 39, Jan. 1951, p. 85-86.

Data on steel scrap consumption. (A4, A8, ST)

61-A. Western Steel Plants Increasing Output Rapidly. Thomas A. Dickinson. *Blast Furnace and Steel Plant,* v. 39, Jan. 1951, p. 87-92.

An illustrated survey. (A4, ST)

62-A. Los Angeles County Air Pollution Control; A Progress Report. 1. The Apex Steel Corp. Ltd. Installation. T. L. Harsell, Jr. **2. The General Metals Corp. Installation.** F. L. Stamm. *Western Metals,* v. 9, Jan. 1951, p. 28-30.

The installations and results obtained. (A7)

63-A. New G-E Measurements Laboratory Opened at Lynn, Mass. *Industrial Heating,* v. 18, Jan. 1951, p. 62, 64, 66, 68, 70, 132.

Laboratory for work in magnetism, electricity, chemistry, metallurgy, sound, heat, light, and color. (A9)

64-A. Genius for Rent. Morton M. Hunt. *Steelways,* v. 7, Jan. 1951, p. 4-7.

Facilities and organization for industrial research at Battelle Memorial Institute. Specific examples. Advantages of "renting" the use of brains and equipment available at independent research laboratories such as Battelle. (A9)

65-A. Materials. Wallace R. Brode. *Journal of the Franklin Institute,* v. 251, Jan. 1951, p. 81-92.

Surveys past progress and future possibilities. (A general)

66-A. The Metalworking Industries—Scoreboard for the Decade. H. McLeod. *Canadian Metals,* v. 14, Jan. 1951, p. 10-12, 43-49.

Statistical record for Canada for 1939 to 1950. (A4)

67-A. Metallurgical Research; Review of Progress During the Past Decade. N. P. Allen. *Metal Industry,* v. 78, Jan. 12, 1951, p. 29-30.

Abridged presentation of a lecture. Examples of practical achievements in the nonferrous field. (A general, EG-a)

68-A. Re-Treatment of Metallic Wastes: Especially Zinc Residues. C. C. Downie. *Mining Journal,* v. 236, Jan. 19, 1951, p. 56-57.

Various methods, their technology and economics. (A8, Zn)

69-A. 1950 Iron Ore Production and Shipments. *Skillings' Mining Review,* v. 39, Feb. 17, 1951, p. 1-2.

Data for various U. S. districts. (A4, B10, Fe)

70-A. Steel Expansion. *Monthly Business Review,* v. 33, Feb. 1951, p. 1-2, 6.

Statistical summary, especially since 1936. (A4, ST)

71-A. Metallurgical Developments in 1950. *Engineer,* v. 191, Jan. 26, 1951, p. 119-121.

A review. (A general)

72-A. (Pamphlet) **Engineering Foundation: Annual Report.** Engineering Foundation, 29 W. 39th St., New York 18, N. Y. Oct. 1950, 75 pages.

Progress reports of current projects concerned with fluid meters, plastic flow of metals, furnace performance, riveted and bolted structural joints, reinforced concrete, corrosion of water pipes, building research, iron alloys, diffusion of steel, mechanical properties of binary alloy ferrites, welding, etc. (A9)

B

RAW MATERIALS AND ORE PREPARATION

24-B. Subject: Substitutions. Ernest E. Thum. *Metal Progress,* v. 59, Jan. 1951, p. 51-53.

What can be done by way of alloying-element and metal substitution during the present and coming emergency. Reviews what was done during World War II, and practical prospects for further improvements along these lines. (B10, A4)

25-B. Zirconia Refractory Good to 4600° F. *Steel,* v. 128, Jan. 29, 1951, p. 68.

Properties and applications of new product of Norton Co., Worcester, Mass. (B19)

26-B. Melting of Silicide Compounds. (In Russian.) P. V. Geld and N. N. Buinov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Oct. 1950, p. 1087-1094.

On the basis of chemical, crystallographic, and electron-microscope investigation of the sublimation product from furnaces for melting ferrosilicon, it is shown that losses of Si are related to intermediate formation of silicon monoxide. Origin and composition of smoke deposits and scale formed by these furnaces were investigated. 14 ref. (B22, Fe-n)

27-B. Interfacial Tension of Iron Alloys at the Slag-Metal Boundary. (In Russian.) S. I. Popel, O. A. Esin, and P. V. Geld. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Nov. 11, 1950, p. 227-230.

Results of experimental investigation on cast iron containing 3.45% C, 2.21% Si, 0.64% Mn, 0.263% P, and 0.105% S. Eight different slags were used. (B21, D general, CI)

28-B. Phase Equilibrium Relationships in a Portion of the System MgO-Al_2O_3-2CaO · SiO_2. A. T. Prince. *Journal of the American Ceramic Society,* v. 34, Feb. 1951, p. 44-51.

108 compositions were prepared having an Al_2O_3 content below the line joining 2CaO · Al_2O_3 and MgO · Al_2O_3. Quenching experiments were carried out on 96 of these compositions at temperatures up to 1590° C. Three binary and two ternary eutectic systems are described. These compositions are of significance with respect to basic refractory clinkers made from Canadian dolomitic magnesites and to certain blast-furnace slags. 11 ref. (B21, D1, ST)

29-B. The Behavior of Solutions of Titanium Dioxide in Sulfuric Acid in the Presence of Metallic Sulfates. Recovery of Titania From the Bauxite Sludge. The Behavior of Solutions of Titanium Dioxide in Sulfuric Acid in the Presence of Certain Bivalent Metallic Sulfates. S. M. Mehta and R. P. Poncha. *Journal of the American Chemical Society,* v. 73, Jan. 1951, p. 224-228.

Three companion papers present results of experiments in titanium chemistry which may be of value in recovery of the dioxide for various uses or for reduction to metallic Ti. 10 ref. (B14, Ti)

30-B. Operating Factors In Heavy-Media Processing. Part I. Development of New Equipment Paces Advance in Separation Methods. L. J. Erck. *Mining Congress Journal,* v. 37, Jan. 1951, p. 18-20, 43.

(B14)

31-B. Blast Furnace Sintering Practice Surveyed. Robert E. Powers. *Steel,* v. 128, Feb. 5, 1951, p. 95, 97, 99, 102, 104, 107-108.

Recommendations for improvement. (B16, Fe)

32-B. Sintering Practice at Josephtown Smelter. H. K. Najarian, Karl F. Peterson, and Robert E. Lund. *Journal of Metals,* v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 116-119.

Primary products are Zn metal of various grades, Pb-free ZnO pigments, Cd metal, and H_2SO_4. Zn concentrates of domestic and foreign origin are blended and desulfurized at the roaster plant. Sinter circuits are shown diagrammatically. Dust and fume recovery. (B16, C21, Zn, Cd)

33-B. Reverse Leaching of Zinc Calcine. L. P. Davidson, R. K. Carpenter, and H. J. Tschirner. *Journal of Metals,* v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 134-136.

The electrolytic Zn plant of American Zinc Co. of Illinois was expanded to a capacity of 100 tons of slab Zn daily, but leaching plant was unable to deliver an adequate amount of solution for electrolysis. The leaching method was changed so that acid was added to the roasted Zn. Conditions which prevented satisfactory results before the change and difficulties which arose in reversing the usual leaching procedure. (B14, C23, Zn)

34-B. Some Trends in Iron and Steel Works' Refractories. G. Reginald Bashforth. *Refractories Journal,* Dec. 1950, p. 512-527; disc., p. 528-533.

19 ref. (B19)

35-B. The Treatment of Gold Ores in South Africa and Canada. *Bulletin of the Institution of Mining and Metallurgy,* Jan. 1951; *Transactions,* v. 60, pt. 4, 1950-51, p. 133-141.

Discussion of paper by E. C. Ellwood. (Nov. 1950 issue; see item 334-B, 1950.) (B13, Au)

36-B. Low-Manganese Hessian Limonites and Preparation of Lahn-Dill Ores. (In German.) Joachim Dietrich. *Stahl und Eisen,* v. 70, Dec. 21, 1950, p. 1205-1208.

Methods for beneficiation of Hessian basaltic limonite, Vogelsberg bauxite, and Mardorf "bean" ore. Operations at the Excelsior ore-washing plant, also principles of preparation of red hematite from the Lahn-Dill district and its effect in the blast furnace. (B14, Fe)

37-B. Wet Extraction of Zinc From a Mixture of Sulfides. (In Russian.) I. N. Kuz'minykh and E. L. Yakhontova. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Nov. 1950, p. 1142-1148.

The action of acidic aqueous solutions of $Fe_2(SO_4)_3$ on a mixture of sulfides containing an appreciable amount of Zn, Pb, and Mn was studied. It was found that Mn and Zn can be completely dissolved by a solution of $Fe_2(SO_4)_3$. (B14, Zn)

38-B. Silicon Monoxide in Slags During Production of Ferro Alloys. (In Russian.) P. V. Gel'd and O. A. Esin. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Nov. 1950, p. 1200-1207.

Results of chemical analysis, and of crystallographic and X-ray investigation, showing that slags produced under strongly reducing conditions may be considered as systems containing large amounts of SiO, as well as silicates. Slag samples formed from two immiscible liquid phases, one very rich in SiO, are explained. Effect of presence of SiO in the CaO-Al_2O_3-SiO_2 system. 15 ref. (B22, Fe-n)

39-B. Fundamental Studies on Dissolution of Gold in Cyanide Solutions. II. On Equations of Reactions and Effects of Cyanide Strength and Other Variables on Dissolution Rate. (In English.) Mitsuo Kameda. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Oct. 1949, p. 223-230; Dec. 1949, p. 435-444.

Results of experimental investigation and theoretical analysis. 20 ref. (B14, Au)

40-B. Fundamental Studies on Interfacial Tensions in Flotation. II. Surface-Tension Variation, Surface Activity, and Surface Orientation of Frothers at Air-Water Interface. (In English.) Masayoshi Wada. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Dec. 1949, p. 425-434.

It was found that surface tension of cineol solutions varies appreciably during measurement by a tensiometer. Time variation of surface tension of aqueous solutions of frothers was theoretically analyzed. Activity coefficients of pure and commercial frothers were calculated. An equation for relation between surface pressure and surface concentration of various frothers. Relation between surface pressure and area occupied by a gram molecule is expressed by a formula. (B14, P10, P12)

41-B. Sintering and Preparation of Iron Ores at the Plant of "Altos Hornos de Viscaya. S. A." (In Spanish.) F. Millan and F. Barbadillo. *Instituto del Hierro y del Acero,* v. 3, Jan.-Mar. 1950, p. 47-53.

A proposed plant to sinter mixtures of Spanish iron ores, with total capacity of 2000 tons per day. Two Dwight-Lloyd machines will be used. (B16, Fe)

42-B. Errors in Grading Analyses. L. Ackermann. *Mining Magazine,* v. 84, Jan. 1951, p. 9-20.

An investigation of incidence, magnitude, and causes of normally occurring errors in routine screen analyses and of experiments conducted to determine the most suitable method of conducting such

analyses on sand and slime produced from conglomerates and quartzites of the Witwatersrand Banket Series in South Africa. 10 ref. (B13)

43-B. The Vanadium Minerals. Part II. Mineral Sources of Vanadium. F. F. Franklin. *Vancoram Review*, v. 6, No. 4, 1950, p. 10-11.
(B10, V)

44-B. Substitutes for Pig Iron. G. S. Baldwin. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 91-92; disc., p. 95.

Natural-gas-coke charging practice. Results as compared to other carburizing materials.
(B22, D2, ST)

45-B. Use of Graphite in the Cold-Metal Charge. Clyde B. Jenni. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 93-95; disc., p. 95.

Practice at General Steel Casting Corp., Eddystone, Pa. (B22, D2, ST)

46-B. Substitutes for Pig Iron—Economics and Effect on Production. R. C. Solomon. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 96-98; disc., p. 98-100.
(B22, D2, ST)

47-B. Quality of Raw Materials. Gordon McMillin and John R. Patton. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 103-106; disc., p. 106-107.

Use of limestone, burnt lime, fluorspar, and pig-iron substitutes, based on data obtained from 59 cold-metal nonintegrated basic open-hearth furnace plants in the U. S. and Canada.
(B22, D2, ST)

48-B. Australia's Copper Industry. L. A. Lyons. *Mine & Quarry Engineering*, v. 17, Feb. 1951, p. 41-47.

Reserves, mining, beneficiation, and smelting.
(B10, B12, B14, C21, Cu)

49-B. Action of Titanium Tetrachloride on Ilmenite. (In French.) Claude Pascaud. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 231, Nov. 27, 1950, p. 1232-1233.

Treatment with $TiCl_4$ at 850° C. under 30 mm. Hg eliminates oxides of Fe and other metals except silica and alumina. Application of the principle to a method for separation of Fe and Ti from ilmenite-type ores. (B14, Fe, Ti)

C

NONFERROUS EXTRACTION AND REFINING

13-C. Preliminary Study of the Recovery of Alumina From Oregon Laterites. J. S. Chittenden and R. W. Moulton. *Trend in Engineering at the University of Washington*, v. 3, Jan. 1951, p. 18-22.

Results of experimental work on the Pedersen electric-furnace process. The factors investigated were: optimum carbon-laterite ratio; effect of limestone on amount of Al_2O_3 recovered; amount of iron ore added to the charge; temperature and time of reaction; and optimum conditions for extraction of Al_2O_3 from the slag. 13 ref. (C21, Al)

14-C. Continuous Casting Process Employs a Moving Mold. D. I. Brown. *Iron Age*, v. 167, Jan. 25, 1951, p. 53-55.

Improved Hazlett process and equipment, which incorporate a moving rather than a stationary or oscillating mold. Water-cooled steel bands traveling over drum pulleys form the mold. The mill requires very little space and power requirements are low. Production machines for brass and aluminum are under consideration. (C5, Cu, Al)

15-C. The Solubility of Lead in Zinc Sulphate Solutions. C. W. Barker, J. Powell, and R. S. Young. *Journal of the Society of Chemical Industry*, v. 69, Dec. 1950, p. 362-363.

Small quantities of Pb are almost invariably present in the purified $ZnSO_4$ solution which constitutes the electrolyte in Zn refineries. Hence results of investigation of the solubility of Pb in $ZnSO_4$ may be of interest to workers in various mining and metallurgical industries.
(C23, P13, Zn)

16-C. Influence of Cathodic and Anodic Current Densities on Current Flow During Electrolysis of Fused Lead Chloride. (In Russian.) G. A. Abramov and V. S. Zernyakov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Oct. 1950, p. 1056-1066.

Apparatus and experimental data.
(C23, Pb)

17-C. Preparation of Titanium Tetrachloride From Rutile. C. H. Gorski. *Journal of Metals*, v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 131-133.

Method consists of reducing rutile with coke and chlorinating the reduced product at 200-500° C. The crude distillate is purified by treatment with Cu powder and distillation. Recoveries exceeding 90% of the titanium in the rutile were obtained. (C4, C22, Ti)

18-C. Metallurgical Reactions of Fluorides. Herbert H. Kellogg. *Journal of Metals*, v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 137-141.

Graphs representing standard free energy of formation as a function of temperature for 21 fluorides, along with estimated values for 20 additional fluorides. A few possible uses of these data in metallurgical calculations, including fluorination of oxides, sulfides, and chlorides, and reduction of metal fluorides. 19 ref.
(C4)

19-C. The Preparation and Some Properties of Curium Metal. J. C. Wallmann, W. W. T. Crane, and B. B. Cunningham. *Journal of the American Chemical Society*, v. 73, Jan. 1951, p. 493-494.

Curium metal has been prepared on a microgram scale by reduction of curium trifluoride with Ba vapor at 1275° C., using a vacuum furnace and double crucible system similar to that described by Fried and Davidson. Six successful reductions, which yielded bright metallic globules of metal ranging in mass from about 0.01 to 4 g. were made. The metal is silvery in appearance and about as malleable as plutonium prepared under the same conditions.
(C25, Cm)

20-C. Refining Lithium by Vaporization at Low Pressure. R. R. Rogers and G. E. Viens. *Canadian Mining and Metallurgical Bulletin*, v. 44, Jan. 1951, p. 15-20; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 54, p. 14-19.

Experiments demonstrate that crude commercial Li containing about 0.5% Na can be refined, the resulting metal containing as low as 0.001% Na. During the process, the metal is vaporized and condensed at a pressure of less than 0.04 micron. Operating data and experimental equipment. (C22, Li)

21-C. Some Aspects of Titanium Reduction Metallurgy. N. S. Spence. *Canadian Mining and Metallurgical Bulletin*, v. 44, Jan. 1951, p. 21-28; disc., p. 28; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 54, p. 20-27, disc., p. 27.

Reviews and correlates recent literature. 41 ref.
(C23, C26, C2, C4, Ti)

22-C. Factors Affecting the Reduction of Zinc Oxide by Carbon. D. W. Hopkins and A. G. Adlington. *Bulletin of the Institution of Mining and Metallurgy*, Jan. 1951; *Transactions*, v. 60, pt. 4, 1950-51, p. 101-116.

These factors were examined on a laboratory scale. Nut charcoal, carbon black, and electrode carbon, of particle size less than 5μ, were mixed with powdered ZnO and reacted at 980-1100° C. Rate of reduction of the oxide, and CO/CO_2 ratio in the retort atmosphere at various stages of reduction, were calculated. Kinetics of the process are analyzed. 20 ref. (C21, Zn)

23-C. A Study of the Reduction of Zinc Metaferrite by Carbon. D. W. Hopkins and A. G. Adlington. *Bulletin of the Institution of Mining and Metallurgy*, Jan. 1951; *Transactions*, v. 60, pt. 4, 1950-51, p. 117-128.

$ZnO \cdot Fe_2O_3$ was heated with carbon at 600-1050° C. for periods of 2 and 4 hr. In addition to continuous gas analysis, free ZnO, total ZnO, and metallic Fe were determined in the residue, and proportions of the various compounds present were calculated. Shows that the reduction takes place in four stages. A marked effect of the presence of oxides of iron was demonstrated. At the highest temperatures, Zn vapor generated by local reaction was partially reoxidized by CO_2-rich gas resulting from reduction of residual iron oxide. 11 ref. (C21, Zn)

24-C. A Contribution to the Metallurgy of the Parkes Process. (In German.) Friedrich Johannsen and Kurth-Heinz Lange-Eichholz. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 3, Dec. 1950, p. 397-402.

Solubility of Ag and Zn in the area of the Pb-Ag-Zn diagram in which addition of Zn causes segregation of Ag was investigated. Solubility isotherms were established. Develops a formula for the consumption of Zn, and compares silver-recovery methods used in Germany and in the U. S. Includes constitution diagrams and tables.
(C21, M24, Zn, Ag)

25-C. Metallothermic and Certain Other Processes. (In Russian.) P. V. Gel'd and R. M. Lerinman. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Nov. 1950, p. 1191-1199.

Microscopic investigation of partially reacted briquets of Cr ore and Si showed that silicothermic reduction of oxides is accompanied by intermediate formation of SiO. Electron microscope study of the smokes formed during silicothermic production of carbon-free ferrochromium and forromolybdenum indicates that they consist basically of spherical particles. Structural peculiarities of smokes obtained during aluminothermic reduction of Ti, melting of electrocorundum, and production of fused magnesite, and mechanisms of their formation. Includes electron micrographs.
(C26, Fe-n, Cr, Mo, Ti)

26-C. Electrolysis of Salts of Copper and Bismuth. (In Russian.) M. T. Kozlovskii and P. P. Tsyb. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Nov. 1950, p. 1208-1222.

Relationships of potential of the mercury cathode during electrodeposition of Cu and Bi, and of the anode during electrolytic dissociation of the amalgam obtained on concentration of metal in the amalgams at different current densities and temperatures, and on composition of the electrolyte and rate of intermixing of salts of Cu. Necessity of considering change of viscosity of the amalgam and related change of true surface area of mixed amalgams during mercury-electrode electrolysis. Possibility of quantitative recovery of Cu and Bi from their corresponding amalgams by anodic oxidation was established. 37 ref. (C29, L17, Cu, Bi)

27-C. Smelting Antimony in Yugoslavia. C. W. Jensen. *Mining Magazine,* v. 84, Jan. 1951, p. 20-22.

Modernization of the smelters. (C21, Sb)

28-C. Electrothermic Production of Metallic Carbides. (In French.) *Journal du Four Electrique Industries Electrochimiques,* v. 59, Sept.-Oct. 1950, p. 121-122.

Factors influencing the process, such as purity of basic materials, grain-size distribution of charge, composition, pressure, and temperature. This study was made by use of micrographic, X-ray, and thermal methods and by analysis of equilibrium diagrams of the components. (C21, M21, M23, C-n, W, Ti)

29-C. Large Furnaces for Electrolytic Production of Aluminum. (In French.) M. L. Ferrand. *Journal du Four Electrique et des Industries Electrochimiques,* v. 59, Sept.-Oct. 1950, p. 114-117; Nov.-Dec. 1950, p. 142-144.

New type of furnace which resulted in a decrease of electric current consumption from 18-20,000 to 15,000 kw-hr. per ton; and of labor from 45-50 to 25 manhours per ton. (C23, Al)

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FERROUS REDUCTION AND REFINING

28-D. Specifications for Open Hearth Charge Oxides. *American Iron and Steel Institute,* Contributions to the Metallurgy of Steel, no. 36, Aug. 1950, 29 pages.

The specifications are based on completed questionnaires covering performance and properties. Questionnaires were answered on the basis of actual experience. (D2, S22, ST)

29-D. Progress in Electric Steelmaking. Sidney W. Poole. *Metal Progress,* v. 59, Jan. 1951, p. 93, 102, 104, 106, 108, 110, 112.

Reviews proceedings of AIME's Electric Furnace Steel Conference, Pittsburgh, Dec. 1950. (D5, ST)

30-D. Electrothermics and Electrothermal Processes; Castner Memorial Lecture. Christian H. Aall. *Chemistry & Industry,* Dec. 30, 1950, p. 830-840.

History, direct vs. alternating current, single-phase vs. 3-phase power, power factor, electrode configuration, electrodes, covered furnaces, rotating furnaces, furnace operation, and furnace construction. Some specific electric-furnace processes, including manufacture of CaC_2 and $CaCN_2$, of ferro-alloys, of phosphorus, and of electric pig iron. (D5, D8, Fe)

31-D. Mineral and Chemical Changes in Periclase Brick Under Conditions of Steel Plant Operation. R. G. Wells and L. H. Van Vlack. *Journal of the American Ceramic Society,* v. 34, Feb. 1951, p. 64-70.

Definite zones were developed by periclase refractories during service in openhearth furnaces. These zones represent a concentration gradient through the brick that results from the thermal gradient across the brick and from absorption of material from the furnace atmosphere. 16 ref. (D2, ST)

32-D. Temperatures of Openhearth Bottoms Measured. Roland B. Snow. *Iron Age,* v. 167, Feb. 1, 1951, p. 103-106; Feb. 8, 1951, p. 98-100.

Rammed bottoms of the same depth were found to show similar thermal gradients providing equal insulation is used. Drill-core data show that all bottoms eroded to about the same depth after limited service regardless of composition or burning-in schedule. As a result of the experiments, better design, materials, and methods are recommended. (D2, ST)

33-D. Horizontal Continuous Casting Machine. *Iron and Steel Engineer,* v. 28, Jan. 1951, p. 144, 147.

New development in continuous casting of steel, recently patented by J. F. Jacquet, technical secretary of the Belgian Blast Furnace and Steel Works Association. Several advantages are claimed. (D9, ST)

34-D. New Refractory Hung Arch Reduces Furnace Failures. *Journal of Metals,* v. 191, Feb. 1951, p. 96.

Design suitable for arches of openhearth, soaking-pit, and many other types of steel mill furnaces. (D2, F21, ST)

35-D. Electric Furnace Roof Refractories. T. A. Blackwell. *Journal of Metals,* v. 191, Feb. 1951, p. 100.

Experiences of Atlas Steels, Ltd., Welland, Ont., in connection with various materials and structural designs. (D5)

36-D. Observations on Rimming Steel Ingots. A. Hultgren, G. Phragmen, S. Wohlfahrt, and J. E. Ostberg. *Journal of Metals,* v. 191, Feb. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 101-110.

Detailed study of a number of rimming ingots, both low and high carbon, and especially of effects of superimposed air pressure. Requirement to suppress core bubbles is between 10 and 15 atm. at 6.5 atm.; freezing was in semikilled manner; and, at 3 atm., steel was of rising type. Probable mechanism of freezing under various conditions. (D9, ST)

37-D. Carbon Block Proposed for Open-Hearth Bottoms. *Steel,* v. 128, Feb. 12, 1951, p. 82, 84.

Subhearth lining of machined carbon blocks affords extra protection against furnace breakouts. Original installation savings range from $3000 to $5000. (D2, ST)

38-D. Trends in Steel Plant Controls for Quality. H. J. Forsyth. *Blast Furnace and Steel Plant,* v. 39, Jan. 1951, p. 69-73, 77.

Quality control in blast furnaces, bessemer convertors, the openhearth. Spectroscopy, conservation of manganese, oxidation loss, and blooming and finishing mills. (D general, F23, S12, Fe, ST)

39-D. Increase of Ingot Mold Life Versus Surface Quality of Billets. Louis A. Boldizar. *Blast Furnace and Steel Plant,* v. 39, Jan. 1951, p. 74-77.

In an effort to achieve both increased ingot mold life and improved surface quality of billets, the following problems were studied in plant practice: cutting or washing out of plug area of ingot mold; refractory material embedded in the surface of billets rolled directly from reheated ingots; and billet defects due to metal splash during initial pouring. Use of plywood discs in the bottoms of the molds practically doubled mold life and improved billet surface quality. (D9, ST)

40-D. Ionic Theory of Slag-Metal Equilibria. Part II. Applications to the Basic Openhearth Process. P. Herasymenko and G. E. Speight. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 289-303.

The relationships between total number of ions, or ionic fraction of oxygen ions and sum of the acids can be represented by empirical curves. Using these relationships, equilibrium ratios derived in Part I can be expressed as nomograms for calculation of O_2 content of liquid steel and of desulfurization ratio from slag analysis. Oxygen content of the basic steel is a function of FeO content of FeO and of sum of the acids. Analytically determined O_2 contents agree, within limits of experimental error, with O_2 contents calculated from slag analysis and corrected for effect of temperature and of carbon. The equilibrium between the trivalent and bivalent Fe in slag and liquid steel was examined empirically. Effects of small amounts of fluoride in the basic slag were also investigated. 30 ref. (D2, ST)

41-D. Joint Discussion on the Papers. "Distribution of Materials in the Blast-Furnace. Part II. Compensated Charging," by H. L. Saunders and R. Wild; **"Investigations on an Experimental Blast-Furnace",** by H. L. Saunders, G. B. Butler, and J. M. Tweedy; and **"A Radio-Active Technique for Determining Gas Transit Times in a Driving Blast-Furnace",** by E. W. Voice. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 315-318.

Covers above papers published in the Sept., Oct., and Nov. 1949 issues, respectively (see items 2B-260, 2B-284 and 2B-319, 1949). Includes authors' replies. (D1, Fe)

42-D. Discussion on the Paper: "The Effect of Sodium Oxide Additions to Steelmaking Slags. Part I. Use of Soda to Dephosphorize Pig Iron at 1400° C.," by W. R. Maddocks and E. T. Turkdogan. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 320-322.

Covers above paper published in July 1949 issue (see item 2B-283, 1949). Includes authors' reply. (D2, B21, ST)

43-D. Distribution of Materials in the Blast-Furnace, Part III. Further Factors Influencing the Distribution of Solids in the Blast-Furnace. R. Wild. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 339-348.

Previous studies were extended to further consideration of effects of modifications in design and operation of the head-gear and nature of the materials charged. (D1, Fe)

44-D. O. H. Furnace Pressures; Reduction of Errors in Measurement Due to Buoyancy. J. Chapman and G. Lomas. *Iron and Steel,* v. 24, Jan. 1951, p. 3-6.

Control of furnace pressure is used in order to reduce air infiltration. Usually a recording instrument is connected by means of a pipeline to a piece of pipe inserted in the crown of the furnace. A systematic study of errors and their variation as a result of different factors was made. Use of a water-cooled front-wall leg plus a short crown leg reduced buoyancy errors from as much as 0.1 in. H_2O to about 0.01 in. H_2O. (D2, S18, ST)

45-D. The Conversion of Pig Iron Into Steel in the Converter Using Pure Oxygen. (In German.) Heinrich Hellbrugge. *Stahl und Eisen,* v. 70, Dec. 21, 1950, p. 1208-1211.

Procedure which proves the practicability of converting pig iron into steel by use of very pure oxygen. (D3, ST)

46-D. Model Experiments on the Flow of Hot Gas in Openhearth Furnaces. (In German.) Fritz Schultz-Grunow. *Stahl und Eisen,* v. 70, Dec. 21, 1950, p. 1211-1213.

A study using water or air, which made it possible to increase efficiency of the furnace by slightly altering its design and to explain differences in output of identical furnaces. Photographs show flow patterns. (D2, ST)

47-D. Flow Conditions in Openhearth Furnaces Indicated by British Model Experiments. (In German.) Michael Hansen. *Stahl und Eisen,* v. 70, Dec. 21, 1950, p. 1213-1219.

Critical discussion of three British reports on work done in glass models using water and Al powder. Numerous diagrams and photographic flow patterns. Indicates good agreement with former German work and with plant observations. Possibilities of improved design. (D2, ST)

48-D. Use of Oxygen in the Electric Arc Furnace. (In German.) Max Hauck and Harro Werwach. *Stahl und Eisen,* v. 71, Jan. 4, 1951, p. 15-18.

More than 100 experiments were made to determine whether use of O_2 would result in improvement of quality or economic advantages. Results were satisfactory in both respects. (D5, B22, ST)

49-D. Use of Pure Oxygen in the Refining of Stainless Chromium-Nickel Steels. (In German.) Friedrich Illian. *Stahl und Eisen,* v. 71, Jan. 4, 1951, p. 18-19.

Experiments show that this method of melting Cr-Ni scrap is successful in reducing carbon content to 0.05% without reducing the Ni content, and in reducing the consumption of electrode material and of electric power. Data are graphed and tabulated. (D5, B22, SS)

50-D. Effect of Design and Size of Ingot Moulds on Their Life. (In Polish.) K. Radzwicki. *Prace Badawcze Glownego Instytutu Metallurgii i Odlewnictwa,* v. 2, No. 4, 1950, p. 285-308.

Effect of individual design factors on life of ingot molds and on the steel solidification process. Design and life of ingot molds used in Polish steel plants, and some recommendations for their standardization and redesign. (D9, ST)

51-D. Slag and Removal of Elements in the Basic Openhearth Process. Analysis Based on Statistical Methods. Part II. Phosphorus. (In Polish.) E. Bucko. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa,* v. 2, No. 4, 1950, p. 309-325.

Influence of individual factors on removal of P and on its rate is considered on the basis of statistical analysis. Relation between P_2O_5-P ratio, phosphorus content of the bath, and slag basicity. The influence of total Fe content of slag on P removak (D2, ST)

52-D. Blast Furnace Linings Made From Granular Carbon. (In Spanish.) Francisco Millan de Val. *Instituto del Hierro y del Acero,* v. 3, July-Sept. 1950, p. 210-222.

Experiences in a Spanish plant using carbon blast furnace linings instead of aluminosilicate refractories. Details of furnace construction. (To be continued.) 12 ref. (D1, Fe)

53-D. The Physical Chemistry of Steelmaking. Part I. Karl L. Fetters. *Industrial Heating,* v. 18, Jan. 1951, p. 74, 76, 78, 80.

Advances made in slag-metal and physical-chemistry research in the last 20 years. (To be continued.) (D general, ST)

54-D. The Design of a New Open Hearth Shop. II. H. E. Warren, Jr. *Industrial Heating,* v. 18, Jan. 1951, p. 82, 84, 86, 88.

Materials used in construction; general plant layout for efficient materials flow; and auxiliary equipment. (To be continued.) (D2, ST)

55-D. Refractory Practice in Acid Electric Steel Melting. R. H. Jacoby and M. Petty. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 359-363; disc., p. 363-364.

Previously abstracted from *American Foundryman.* See item 93-D, 1950. (D5, ST)

56-D. Manganese Recovery in Acid Electric Steelmaking. Sam F. Carter. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 471-490; disc., p. 490-491.

Previously abstracted from preprint. See item 151-D, 1950. (D5, ST)

57-D. Effect of Hot Metal on Openhearth Production. William A. Greene. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 13-23.

Previously abstracted from *Blast Furnace and Steel Plant.* See item 114-D, 1950. (D2, ST)

58-D. Factors Affecting Surface Quality of Plain Carbon, Fully Killed, Open-Hearth Steels. R. L. Roshong and G. P. Michalos. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 25-33.

Variations in melting and pouring practices as they affect surface quality. (D2, D9, CN)

59-D. Use of Oxygen Jets Through the Back Wall. A. E. Reinhard. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 43-48; disc., p. 48-51.

Previously abstracted from *Journal of Metals.* See item 182-D, 1950. (D2, B22, ST)

60-D. Progress Report on the Use of Metallurgical Oxygen. P. W. Nutting. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 51-59; disc., p. 59-61.

Use for decarbonizing and its decreasing use for flame enrichment. Damage to furnace refractories. (D2, B22, ST)

61-D. Faster Charging Practice. Vernon W. Jones. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 62-65; disc., p. 65-68.

Armco Steel Corp. shop is being designed so that there can be no interference caused by two adjacent furnaces charging at the same time. (D2, ST)

62-D. One Method of Handling Stool Stickers. Roger Wolcott. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 68-70; disc., p. 70.

Practice at Jones and Laughlin Steel Corp., with particular reference to experience with carbon inserts. Methods of preventing stool stickers, and methods employed when preventive measures fail. (D2, ST)

63-D. A Few Factors Affecting Stool Stickers. C. G. McCabe. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 71-73; disc., p. 73-74.

Composite stool used by the Wheeling Steel Corp. for low-carbon steel production. Performance. (D2, CN)

64-D. New Mold Coatings. Harold J. Walker. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 75-76; disc., p. 76-77.

A tar ingot-mold coating used by Republic Steel Corp. consists of a tar pit heated by a steam line, a table to support a mold, and a 20-hp. motor to circulate the tar. Advantages and disadvantages of other coating materials tested in the search for a substitute for tar. (D9)

65-D. New Mold Coatings. J. J. Golden. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 77-80; disc., p. 80-81.

Testing program at the Gary plant of Carnegie-Illinois Steel Corp., to evaluate several ingot mold coating materials, to obtain a mold coating that does not give off fumes and that approaches tar in performance and cost. (D2)

66-D. A Method of Nozzle Setting. W. G. McDonough. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 81-83; disc., p. 83-87.

Method used at National Works, National Tube Co., on both 60-ton bessemer ladles and 185-ton openhearth ladles. (D9)

67-D. Changes in Roof Design and Elevation and Their Effect on Roof Life. R. P. Carpenter. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 87-88; disc., p. 88-89.

Design used by Republic Steel Corp,. Cleveland, for satisfactorily cooling a skew channel. (D2)

68-D. Charging Practice and Its Effect on Production. William Schwinn. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 101-102; disc., p. 102.

Previously abstracted from *Journal of Metals.* See item 235-D, 1950. (D2, ST)

69-D. Cupola Practice at the Stanley Works. R. L. Baldwin. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 108-110; disc., p. 110-111.

Cupola installation for supplying hot metal of uniform analysis to openhearth furnaces. Charging practice, desulfurizing practice, and cupola performance. (D2, ST)

70-D. Oxygen for Carbon Reduction and Temperature Pickup. E. H. Reyer. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 111-113; disc., p. 113-114.

Previously abstracted from *Journal of Metals.* See item 221-D, 1950. (D2, B22, ST)

71-D. Oxygen in Liquid Open-Hearth Steel—Oxidation During Tapping and Ladle Filling. T. E. Brower, J. W. Bain, and B. M. Larsen. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 161-180; disc., p. 180-183.

Previously abstracted from *Journal of Metals.* See item 183-D, 1950. (D2, D9, ST)

72-D. Conservation of Manganese. Shadburn Marshall. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute*

of Mining and Metallurgical Engineers, v. 33, 1950, p. 186-188.

Advantages and disadvantages of several methods of Mn conservation including materials for charge and additions of Mn-containing ferroalloys to furnace or ladle.
(D2, B22, ST, Mn)

73-D. The All-Basic Open Hearth, European and American. R. P. Heuer and M. A. Fay. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 189-212; disc., p. 213-216.

Previously abstracted from *Journal of Metals*. See item 188-D, 1950. (D2, ST)

74-D. Progress Report on All-Basic Furnace at South Works, Carnegie-Illinois Steel Corporation. M. F. Yarotsky. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 217-218.

Stability of basic construction, production rates, delays, fuel utilization, and over-all economy of the all-basic design as compared to conventional silica furnaces.
(D2, ST)

75-D. Progress Report on All-Basic Furnace at Steel Company of Canada. A. K. Moore. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 219-220.

Data on productive and cost differentials between the all-basic furnace and comparative furnaces with silica main roofs. Compares it with similar data reported in 1949.
(D2, ST)

76-D. Comparison of Burned and Unburned Brick in Basic Ends. R. C. Solomon. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 222; disc., p. 222-223.

Data collected by Granite City Steel Co., Granite City, Ill. (D2, ST)

77-D. Sillimanite Brick in Linings of Hot-Metal Mixers. F. A. Colledge. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 224-231; disc., p. 231-238.

Experiences of Carnegie-Illinois Steel Corp., Munhall, Pa. (D2, ST)

78-D. A Method of Estimating Thickness of Hot-Metal Mixer Linings. L. L. Wells, Jr. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 238-241.

Method used at South Works, Carnegie-Illinois Steel Corp., Chicago. Precautions necessary. (D2, ST)

79-D. Performance of High-Magnesia Ramming Mixes. Rudolph Smith. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 242-244; disc., p. 244.

Previously abstracted from *Journal of Metals*. See item 149-D, 1950. (D2, ST)

80-D. Clay-Graphite Brick for Lining Open-Hearth Ladles. Ernest B. Snyder. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 244-247.

Tests made in the openhearth shop of Wheeling Steel Corp., Steubenville, Ohio. (D2, ST)

81-D. Flow and Velocities of Air and Waste Gases. H. V. Flagg. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 253-259; disc., p. 260-267.

Previously abstracted from *Journal of Metals*. See item 220-D, 1950. (D2, ST)

82-D. Fuel Consumption in the Open-Hearth Furnace. A. J. Fisher. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 268-275; disc., p. 275-276.

Relation of fuel consumption to bath design and size of heat, furnace efficiency, and flame efficiency. (D2, ST)

83-D. Optimum Firing Rates. G. C. Primm. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 277-282.

Factors affecting firing rate. Compares amount of fuel put into furnaces of different sizes in regard to furnace life. Data are tabulated and plotted. (D2, ST)

84-D. Present Status of Multiple Burners. L. D. Woodworth. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 283-286; disc., p. 286-287.

Favorable experiences at the Ohio Works, Carnegie-Illinois Steel Corp. Burner design. Compares furnace operations using single and double burners. (D2, ST)

85-D. A Study of Some of the Physical Characteristics of Acid Open-Hearth Slags. Charles R. Funk and Kenneth Midlam. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 292-307; disc., p. 307-312.

Physical appearance, chemical analysis, and petrographic analysis of thin sections prepared from pancake tests were studied. Tables, graphs, photographs, and micrographs. (D2, B21, ST)

86-D. Practical Interpretation of Steelmaking. C. F. Christopher. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 33, 1950, p. 313-327; disc., p. 327-332.

Deals with the characteristics of steel under different conditions from the time it is ready to be deoxidized until it is finally heat treated. Types of defects and their causes.
(D2, ST)

87-D. Operation of Blast Furnaces at Elevated Pressures. (In French.) Pol-Michel André. *Revue de Métallurgie*, v. 47, Dec. 1950, p. 873-888.

Theoretical studies and experimental research resulting in development of the process. Modifications of blast-furnace construction for operation with elevated pressure. Application to the French metallurgical industry. 37 ref. (D1, ST)

88-D. Influence of Duration of the Blast on Nitrogen Content of Basic Bessemer Steels. (In French.) M. Delong. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques*, v. 7, nos. 8-10, (1950), p. 381-420.

Data on 42 charges of different compositions. Besides duration of the blast, a series of other factors, such as temperature of decarburization, internal shape of the converter, Si and P contents, etc., influence the N_2 content to a marked extent. In certain cases, the accelerated blast may even be harmful to the quality of the steel. (D3, ST)

89-D. Blast Furnace-Foundry Pig Iron With Hematite. (In Czech.) Jindrich Sarek. *Hutnické Listy*, v. 5, Nov. 1950, p. 443-445.

Fundamental difference between the quality of a coarse-grained foundry pig iron, and the influence of various factors on the grain size. Basic slags and mode of operation of the blast furnace are considered to be of most importance. (D1, Fe)

90-D. Thermal Analysis of Operation of an Openhearth Furnace. (In Czech.) Antonin Benda. *Hutnické Listy*, v. 5, Nov. 1950, p. 454-458.

Mathematical relationships are derived for openhearth furnace efficiency vs. specific heat and fuel consumption. Efficiency and fuel consumption are related to stack draft. Using the equations presented, means of improving efficiency can be deduced. (D2, ST)

E

FOUNDRY

52-E. Mold Materials Are Factors in Gray Iron Shrinkage. W. F. Bohm. *American Foundryman*, v. 19, Jan. 1951, p. 26-29.

It is commonly believed that the metal alone is responsible for defects in gray iron castings caused by shrinkage. However, recent investigations have proven that mold materials are also an important factor. Progress report on investigations conducted at Buick's gray iron foundry on the influence of mold material and the mold-wall movement concept. Effects of molding conditions, melting conditions, clay content, and sea-coal content.
(E19, CI)

53-E. Ferrous Casting in Australia. *American Foundryman*, v. 19, Jan. 1951, p. 32-35. (Excerpts from paper by T. Watson, K. Spencer, A. T. Batty, and W. Dummett.)

Production figures; varieties of castings produced; sand practices; melting practices; metallurgical control; mechanization. (E general, CI)

54-E. Modern Foundry Methods: Plaster Molding for Precision Casting Put on Production Basis. J. J. McClain. *American Foundryman*, v. 19, Jan. 1951, p. 36-39.

Equipment and procedures of Fabricast Div., General Motors Corp. in production of the five precision Al-alloy castings for the converter end of the Buick automatic transmission. (E15, E16, Al)

55-E. Foundry Sand—Getting Down to Fundamentals. Clifford E. Wenninger. *American Foundryman*, v. 19, Jan. 1951, p. 45-48.

A number of ideas derived from work on sand-control fundamentals at University of Kentucky. (E18)

56-E. Basic Lined Cupola Permits Use of Lower Grade Scrap and Coke. Sam F. Carter. *American Foundryman*, v. 19, Jan. 1951, p. 50-51.

Results of four years work at American Cast Iron Pipe Co., Birmingham, Ala. The most promising application seems to be in the nodular-iron field. A second application is use of more high-sulfur scrap and lower-quality coke to make gray iron of normal or low sulfur content without need for ladle desulfurization. Third use is for reducing the phosphorus content directly by oxidation or indirectly by increasing the proportion of steel scrap. A fourth application is in duplex steelmaking. Data are tabulated and charted. (E10, D7, CI)

57-E. Pneumatic Deflashing Jig Speeds Core Flash Removal. John Starr. *Tool Engineer*, v. 26, Jan. 1951, p. 29.
(E24)

58-E. Moulding Technique. W. Pollock. *Foundry Trade Journal,* v. 89, Dec. 28, 1950, p. 551-557.

Methods for casting a large bulkhead door panel and frame, and a dome-shaped casting. (E19, CI)

59-E. Pressure-Cast Aluminium Matchplate Production. *Foundry Trade Journal,* v. 89, Dec. 28, 1950, p. 563-565.

Casting of aluminum under pressure in gypsum plaster molds. An abstract from the Grey Ironfounding Productivity Report and a commentary by B. S. N. Perry, who has had experience with the process in Britain and in America. A note is added on compositions of the plaster for making the mold. (E16, Al)

60-E. Practical Experiences in Producing Nodular Cast Iron. M. M. Hallett. *Foundry Trade Journal,* v. 90, Jan. 4, 1951, p. 3-9, disc., p. 9-12.

Work of a British firm on the Ce and Mg processes. (E25, CI)

61-E. Developments in the Parlanti Casting Process. *Machinery* (London), v. 78, Jan. 4, 1951, p. 3-8.

Since its introduction during the war, the patented casting process, employing anodized Al dies, developed by Conrad Parlanti Castings, Herne Bay, Kent, has made important progress; and, in addition to light alloys, iron and heat resisting steels have now been satisfactorily cast. As compared with gravity die castings made in the usual manner in cast iron or steel dies, those produced from Al dies are claimed to have an improved internal structure free from stress, localized chilling, and cavitation, with excellent surface finish and definition. (E13, T5, Al, CI, ST)

62-E. Foundry Technical Control; Correlation of Production Variants with Performance in Service. *Iron and Steel,* v. 23, Dec. 1950, p. 491-495.

Casting of ingot molds by Distington Engineering Co., Ltd., in England. (E general, T5, CI)

63-E. Composition and Properties of Sands. W. B. Parkes. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Dec. 1950, p. 575-593, disc., p. 594-596.

Emphasis on uses of sands and clays in foundry molds. 10 ref. (E18)

64-E. Core Bonding. R. G. Godding. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Dec. 1950, p. 597-617, disc., p. 618-625.

The base sand, organic binders, green binders, effect of clay on molding properties, properties of baked cores, oil binders, and "extenders". (E21)

65-E. Sand Testing and Its Interpretation in the Foundry. W. B. Parkes. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Dec. 1950, p. 627-642, disc., p. 642-645.

Various methods with emphasis on those which have not been standardized in Britain. (E18)

66-E. High-Frequency Heating Units for Core Baking. R. G. Godding. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Dec. 1950, p. 647-654, disc., p. 654-657.

Experimental investigation of use of these units for baking cores containing different types of binders. (E21)

67-E. The Effect of Pitch and Coal Dust on the Properties of Sands. D. A. Taylor. *British Cast Iron Research Association Journal of Research and Development.* v. 3, Dec. 1950, p. 659-672, disc., p. 672-676.

Effect of coal dust on the physical properties of sand and effect of pitch on the properties of molding sand were determined. Appendix by A. Mayer gives recommended procedure for determination of pitch in molding sand. (E18)

68-E. Natural and Synthetic Sands. W. B. Parkes. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Dec. 1950, p. 677-686, disc., p. 687-691.

Differences in properties of available raw materials; differences due to methods of production; selection of sand; and semi-synthetic sands. (E18)

69-E. Influence of Sand on the Formation of Scabs. D. A. Taylor. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Dec. 1950, p. 693-698, disc., p. 699-701.

Different iron casting defects known as "scabs"; possible causes and remedies. Results of an investigation made to determine the manner in which incidence of the defect is affected by the molding sand used. (E25, CI)

70-E. Remarks on Utilization of Induction Furnaces in Nonferrous Foundries. (In French.) Charles Lachaud. *Revue de Métallurgie,* v. 47, Nov. 1950, p. 817-824.

Observations on induction furnaces, especially as used for melting copper and light alloys. Data are limited to determination of consumption of electrical energy by different types of furnaces and its relation to quality of the product. (E10, Cu, Al)

71-E. Remarks on the Foundry Control of Lead-Bronze Bearings. (In German.) Albert Keil. *Zeitschrift für Metallkunde,* v. 41, Oct. 1950, p. 325-331.

Effects of various foundry conditions, especially of gas content of the melt, on quality. Includes graphed and tabulated data, micrographs, and X-ray pictures. 16 ref. (E25, Cu, EG-c)

72-E. Modernized Foundry Gains in Efficiency and Capacity. Carl G. Presser. *Foundry,* v. 79, Feb. 1951, p. 92-97, 236.

Modernized layout, equipment, and procedures of gray-iron foundry of National Supply Co.'s Engine Div., Springfield, Ohio. (E11, CI)

73-E. A Theoretical Basis for the Design of Gates. Morris J. Berger and Charles Locke. *Foundry,* v. 79, Feb. 1951, p. 112-117, 237-242.

How to predict qualitatively the behavior of liquid metal flowing from a manifold gating system of circular cross section. A design tool for use in conjunction with experience in gating practice. (E22)

74-E. Effect of Time and Temperature on Strength of Baked Cores. Charles E. Fausel. *Foundry,* v. 79, Feb. 1951, p. 118-119, 234-236.

Qualitative discussion of time and temperature effects; also of effects of different materials. (E21)

75-E. How to Cast a Heavy Table. Pat Dwyer. *Foundry,* v. 79, Feb. 1951, p. 120-121, 211-212.

Ramifications of the problem include type of mold, position in mold, number and size of gates and risers, probable shrinkage and contraction, tendency toward warpage, metal composition, temperature and velocity of metal entering the mold, furnace and ladle capacity. The tables were for hydraulic presses (7x10 ft. x 12 in. and 8x13 ft. x 15 in.), of solid cast iron. (E11, CI)

76-E. Foundry Practice for Nonferrous Casting Alloys. *Foundry,* v. 79, Feb. 1951, p. 143-144.

Melting practice and molding sands used. A data sheet. (E10, E18, EG-a)

77-E. Silicon and Its Effect on Cast Iron. Donald J. Reese. *Foundry,* v. 79, Feb. 1951, p. 182, 184.

Its function, foundry technique, effect on structure. (E25, CI)

78-E. Develops New Type Matchplate Frame. Franz Schumacher. *Foundry,* v. 79, Feb. 1951, p. 194, 196.

See abstract of "Insertion Process Cuts Cost of Matchplate Manufacture," *American Foundryman,* item 451-E, 1950. (E17)

79-E. How to Select Nonferrous Alloys for Investment Castings. Rawson L. Wood and Davidlee V. Ludwig. *Materials & Methods,* v. 33, Jan. 1951, p. 78-82.

Foundry characteristics and engineering properties. (E15, EG-a)

80-E. Procedures Used in Precision-Casting Foundry. William F. Davenport. *CADO Technical Data Digest,* v. 16, Feb. 1951, p. 19-23.

Discovery and application of a new precoating material, alumina-silica, which improves precision casting of alloys having a high Cr content. Techniques used in the process are believed superior to those generally used in this field. The work was conducted in a precision foundry at the Materials Laboratory, Air Materiel Command Headquarters. (E15)

81-E. Production of Porcelain Enameled Cast Iron Plumbing Fixtures. Walter Rudolph. *Finish,* v. 8, Feb. 1951, p. 19-21, 53.

A nontechnical description of all principal production operations. (E11, L27, T4, CI)

82-E. Evacuated Permanent Molds Used for Casting Aluminum Cylinders. C. F. Nagel, Jr., B. C. McFadden, and G. D. Welty. *Modern Metals,* v. 6, Jan. 1951, p. 26. (From "Fabrication of Aluminum in Germany", Office of Military Government for Germany.) (E12, Al)

83-E. Centrifugally Cast Hard Metal Alloys Bring Longer Life and Improved Design. Charles E. Rogers. *Western Metals,* v. 9, Jan. 1951, p. 22-23.

Process by which miscellaneous parts subject to extreme abrasion are cast by Stoody Co., Whittier, Calif. Base materials are either ferrous or nonferrous, largely cobalt. In both groups, the hard particles are complex carbides of Cr, W, etc. Experience has shown that best results are obtained when the castings are produced by a special centrifugal process which involves casting at very high speed with a rapid quench. Various applications. (E14, C-n, Fe, Co, SG-m)

84-E. Zirconite Sand in Foundry Practice. *Light Metals,* v. 14, Jan. 1951, p. 50-52.

Properties, and use for casting Al and Mg. It is used chiefly in making molds and cores or facings in which high casting temperatures prevail, other important uses being linings for induction melting furnaces, and seals for metal heat treatment furnaces. (E18, Al, Mg)

85-E. Cast Structures in Super-Pure and Commercially Pure Aluminium. V. Kondic and D. Shutt. *Journal of the Institute of Metals,* v. 78, Sept. 1950, p. 105-117.

Macrostructures of cast super-pure and commercially pure Al were correlated with: degree of superheating of the metal, rate of cooling, and turbulence in the metal during the filling of the mold. Foreign nuclei play the greatest part in refining the grain-size of the two grades of Al used; mechanical disturbance is not so effective; and increasing the rate of cooling is least effective. 14 ref. (E25, M28, Al)

86-E. The Influence of Alloy Constitution on the Mode of Solidification of Sand Castings. R. W. Ruddle and A. L. Mincher. *Journal of the Institute*

of Metals, v. 78, Nov. 1950, p. 229-248.

An experimental study of the mechanism of solidification of castings in a number of nonferrous metals and alloys differing widely with respect to constitution, freezing temperature, freezing range, and thermal properties. Solidification of cylinder and slab castings of each material was investigated. Pure metals were Al, Cu, Mg, and Zn. The alloying elements included Sn and Si. (E25, N12, Al, Cu, Mg, Zn)

87-E. Basic Principles of Die Design. The Use of Loose Die Inserts. The Location of Inserts in Die Casting Dies. H. K. Barton and L. C. Barton. *Machinery* (London), v. 77, Dec. 28, 1950, p. 727-731; Jan. 25, 1951, p. 157-164.

(E13)

88-E. Chilled-Roll Manufacture. K. H. Wright. *Foundry Trade Journal,* v. 90, Jan. 11, 1951, p. 33-40; Jan. 18, 1951, p. 61-67; disc., p. 67-68.

First part: history of rolls and requirements of the finished product. General characteristics, such as the formation of chill and its control, composition, and stability of structure. Various qualities of rolls, including alloy rolls, duplex-poured rolls, and the indefinite-chill type; typical compositions. Photomicrographs illustrate structures of different alloy compositions and treatments. Corresponding mechanical properties. Second part: foundry procedures, a modern pulverized-fuel, foundry furnace, and methods of testing and inspection. (E11, T5, CI)

89-E. The Nature of Molding Sand and Its Study by New Testing Methods. (In German.) W. Reitmeister. *Neue Giesserei,* v. 37 (new ser., v. 3), Dec. 28, 1950, p. 585-588.

Attempts to explain why certain sands with low clay content have greater compressive strength than those of higher clay contents. (E18)

90-E. The Behavior of Hydrogen and Water Vapor in Bronze and Red-Brass Melts. (In German.) *Neue Giesserei,* v. 37 (new ser., v. 3), Dec. 28, 1950, p. 593-594. (From paper by P. O. Björkman, S. Brennert, A. Heutz, and A. Wallgram, *Gjuteriet,* v. 40, 1950, p. 61-67.)

Includes results of experiments made to determine effects of H_2, O_2, P, Zn, and Sn on water-vapor content of the melts, which is responsible for porosity. (E25, Cu)

91-E. Problems and Developments in the Malleable Iron Field. (In Swedish). Bertil Tyberg. *Gjuteriet,* v. 40, Nov. 1950, p. 181-188.

A brief survey of the malleablizing process. Methods of melting white iron used in Sweden and the U. S. Utilization of Te as a carbide stabilizer in heavy sections as well as B additions to counteract the bad effects of Cr, with reference to the author's experiments. Different methods employed to shorten the malleablizing cycle or otherwise to make the process more economical. (E10, J23, CI)

92-E. On Metal Penetration in Casting. (In English.) Jiro Kasima. *Reports of the Casting Research Laboratory,* Jan. 1950, p. 7-12.

Various physical and chemical causes and effects of various factors. (E23)

93-E. Evolving Gases on Solidification of Molten Cast Iron. Part I. On Electric Cast Iron. (In English.) Minao Nakano. *Reports of the Casting Research Laboratory,* Jan. 1950, p. 13-16.

Gases evolved were collected and analyzed. Qualitative relationships were found between composition of the evolved gas and chemical composition and fluidity of the cast iron and percentage of waste products in the foundry. (E25, CI)

94-E. Effect of Blast Volume in Cupola Melting. (In English.) Nobutaro Kayama. *Reports of the Casting Research Laboratory,* Jan. 1950, p. 17-19.

Results of investigation. (E10, CI)

95-E. On the Flow-Dynamics of Molten Metals. Part 1. On the Discharge Coefficient of Mercury Through the Small Circular Orifices. (In English.) Kiyoshi Yokota. *Reports of the Casting Research Laboratory,* Jan. 1950, p. 20-25.

First of a series of reports of fundamental investigations made to improve the quality of castings and casting efficiency. (E23)

96-E. How to Use the Cupola. Part II. Bernard P. Mulcahy. *Foundry,* v. 79, Feb. 1951, p. 186, 188-189.

Importance of proper alignment. (To be continued.) (E10, CI)

97-E. Diecasting Machines Fed Automatically. Herbert Chase. *Iron Age,* v. 167, Feb. 15, 1951, p. 100-103.

How electromagnetic molten-metal pumps feed metal directly into diecasting machines, eliminating the hand ladling formerly used. Two pumps act as holding furnaces, receiving metal from one melting unit and insuring a uniform supply of molten metal at constant temperature to two cold-chamber machines. (E13)

98-E. Costs vs. Benefits of Oxygen-Enriched Cupola Melts. Fred Carl. *American Foundryman,* v. 19, Feb. 1951, p. 28-29.

Reviews and summarizes results reported in recent papers by Wick, Clark, and Webbere. (E10, CI)

99-E. What To Do About Air Pollution: Foundry Dust Control Problems. John M. Kane. **Air Pollution and Public Health.** Kenneth E. Robinson. **Air Pollution Legal Aspects.** Thaddeus Giszczak. *American Foundryman,* v. 19, Feb. 1951, p. 34-40.

(E general, A7)

100-E. Eliminate Second Inoculation in New Nodular Iron Process. Albert L. DeSy. *American Foundryman,* v. 19, Feb. 1951, p. 41-45.

Production of Mg-treated nodular iron involves a double treatment. An excess addition of Mg must be made in order to obtain a sufficient amount of residual Mg. Solidification of this iron results in a white or mottled structure. In order to obtain a gray nodular iron it is necessary to apply a second treatment, so-called secondary inoculation or graphitizing, consisting of addition of 0.3% or more of ferrosilicon or other silicon alloy. Results of first experiments show that combined Ca-Mg, Ca-Li, or Ca-Mg-Li treatments make it possible to omit the second step. (E25, CI)

101-E. Molding Unit for 50 Tons Daily Production of Finished Castings. *American Foundryman,* v. 19, Feb. 1951, p. 46-48.

Equipment of Chapman Valve Mfg. Co., Indian Orchard, Mass., which makes all types of iron, steel, and nonferrous valves and sluice gates. (E19)

102-E. Gray Iron Shrinkage Related to Molding Sand Conditions. Clyde A. Sanders and Charles C. Sigerfoos. *American Foundryman,* v. 19, Feb. 1951, p. 49-55.

Extensive experimental investigation at Michigan State College. 34 ref. (E25, E18, CI)

103-E. Norwegian Foundrymen Look at America's Ferrous Foundries. John L. Sissener. *American Foundryman,* v. 19, Feb. 1951, p. 56-58.

Impressions of 18-man Norwegian Foundry Productivity Team.

(E general, CI)

104-E. Beryllium Copper Parts Designed for Investment Casting. John T. Richards. *Product Engineering,* v. 22, Feb. 1951, p. 114-117.

Investment-cast parts designed to take advantage of the unique properties of Be-Cu. Design limitations and advantages inherent in the casting method and physical and mechanical properties of the alloys. Finishing treatments.

(E15, Q general, P general, Cu)

105-E. Operation of the Cupola. W. W. Levi. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 1-19.

Charging equipment, front-slagging cupolas, balanced-blast control, moisture-content control of blast, mechanical charging equipment, front-slagging cupolas, balanced-blast cupola, inoculants, carbon equivalent, and calculating carbon content of the iron. (E10, Fe)

106-E. Aluminum Alloy Castings; A Review of British Achievement. Frank Hudson. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 20-36; disc., p. 37.

Previously abstracted from preprint. See item 199-E, 1950.

(E general, Al)

107-E. Nonferrous Investment Casting. Hiram Brown. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 38-51.

Previously abstracted from *Institute of British Foundrymen,* Paper No. 966. See item 343-E, 1950.

(E15, Al, Cu)

108-E. Controlled Sand Produces Quality Castings. Bradley H. Booth. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 52-62.

Value of a standard control program for sand testing. Reviews the nature of sand, the reason for its use, and sand practice. Types of sand used at 11 representative midwestern foundries, and tests used for control. The better-known sand tests, and their practical value.

(E18)

109-E. Ferrous Melting Furnaces in the United States and Canada. A. W. Gregg. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 63-68.

Progress in the industry, types of furnaces, etc. (E10, Fe)

110-E. A Study of the Principles of Gating. K. Grube and L. W. Eastwood. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 76-99; disc., p. 100-107.

Pouring methods, the design of pouring box, sprue, and horizontal runner and gate systems. Methods employed and results obtained from May 1, 1949 to June 11, 1950. (E22)

111-E. Melt Quality and Fracture Characteristics of 85-5-5-5 Red Brass. F. M. Baker, C. Upthegrove, and F. B. Rote. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 122-131; disc., p. 131-132.

Second progress report. Data obtained in the search for a more rapid method of accurately evaluating melt quality on the basis of fracture characteristics. (E25, Q26, Cu)

112-E. Tenth Annual Report on the Investigation of Steel Sands at Elevated Temperatures. R. G. Thorpe, Peter E. Kyle, and John P. Fraser. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 133-143; disc., p. 143.

Summarizes load-deformation testing and stress-strain characteristics of two synthetic-resin and sand mixtures. Preliminary test work on scab-forming tendencies. (E18)

113-E. Report on A.F.S. Steel Division Research Project. Clyde Wyman. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 144-146.

Fundamental study of the influence of mold and core sand properties on development of hot tears in steel castings. (E18, CI)

114-E. Influence of Dry Sand Conductivity on Rate of Freezing of Steel Slabs. V. Paschkis. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 147-151; disc., p. 151-152.
Previously abstracted from preprint. See item 179-E, 1950. (E18, CI)

115-E. The Contribution of Riser and Chill-Edge Effects to Soundness of Cast Steel Plates. H. F. Bishop and W. S. Pellini. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 185-196; disc., p. 196-197.
The size of cast steel plates which can be made radiographically sound without resource to padding or chills was determined for various riser and chill edge conditions. Temperature measurements were made in plate sections to relate casting soundness to thermal gradients. (E22, CI)

116-E. Technique of Producing Pressure Cast Aluminum Matchplates. Kurt A. Miericke. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 198-201.
Critical steps in the process. (E16, Al)

117-E. A Study of Factors Affecting Molding Sand Density, Shrinkage, Expansion and Workability. R. P. Schauss, R. F. Baley, and E. E. Woodliff. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 217-225; disc., p. 225-228.
Previously abstracted from preprint. See item 182-E, 1950. (E18)

118-E. Effect of Superheating and Casting Temperatures on Physical Properties and Solidification Characteristics of Tin Bronzes. Bernard N. Ames and Noah A. Kahn. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 229-258; disc., p. 258-260.
Previously abstracted from preprint. See item 198-E, 1950. (E25, Q23, Cu)

119-E. Influence of Temperature on Fluidity and Surface Appearance of Steel Castings. G. A. Lillieqvist. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 261-266; disc., p. 266-269.
Previously abstracted from preprint. See item 178-E, 1950. (E25, S16, CI)

120-E. Solidification of Ingots. B. H. Alexander. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 270-273; disc., p. 273-275.
Solidification curves for duralumin were obtained at various pouring temperatures for two different size molds. Effects of overheating upon the solidification curves and upon the length of the columnar crystallization zone. Significance of the dumping method. 15 ref. (E25, Al)

121-E. Some Effects of Deoxidizing Additions on Foundry Malleable Irons. R. W. Heine. *Transactions of the American Foundrymen's Society,* v. 58, 1950. p. 277-293; disc., p. 293-297.
Previously abstracted from preprint. See item 181-E, 1950. (E25, Q general. CI)

122-E. Basic-Lined Cupola for Iron Melting. Sam F. Carter. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 376-392; disc., p. 392.
Previously abstracted from preprint. See item 197-E, 1950. (E10, CI)

123-E. A Thermodynamic Study of Pinhole Formation in Steel Castings. Robert E. Savage and Howard F. Taylor. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 393-396; disc., p. 396-399.
Previously abstracted from preprint. See item 189-E, 1950. (E25, P12, CI)

124-E. Casting of Magnesium-Rare Earth-Zirconium Alloys in Sand Molds. K. E. Nelson and F. P. Strieter. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 400-407; disc., p. 407-410.
Previously abstracted from preprint. See item 194-E, 1950. (E11, Mg, EG-g)

125-E. A Study of the Effect of Various Binders and Additives on Hot Strength of Molding Sands. Robert E. Morey and Carl G. Ackerlind. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 411-421; disc., p. 421-422.
Simplified synthetically bonded sand mixtures containing western bentonite as the primary binder were tested for hot compressive strength at temperatures of 200-2500° F. A reference sand mixture containing 2% western bentonite and 3% water was selected for comparison with mixtures containing other clays and to evaluate effects of secondary sand binders and other additions. Organic binders were studied both as single binders and as secondary binders in combination with western bentonite. Additives were also studied. 59 ref. (E18)

126-E. Optimum Aluminum Additions in Commercial Yellow Brass. R. A. Colton and R. H. Gilbert. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 423-427; disc., p. 427-428.
Previously abstracted from *American Foundryman.* See item 151-E, 1950. (E25, Q23, Cu)

127-E. Pattern Materials and Production in Precision Investment Casting. E. I. Valyi. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 429-438; disc., p. 438.
Previously abstracted from preprint. See item 193-E, 1950. (E15, E17)

128-E. Phenolic Resin Core Binders; Effect of Core Composition on Physical Properties of Cores. J. E. McMillan and J. A. Wickett. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 439-447; disc., p. 447-449.
Previously abstracted from preprint. See item 185-E, 1950. (E18)

129-E. Precision Casting Aluminum in Moist Investment Molds. H. Rosenthal and S. Lipson. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 460-464; disc., p. 464.
Previously abstracted from *American Foundryman.* See item 150-E, 1950. (E15, Al)

130-E. Metal Melting; Application of Thermodynamic Principles to Melting Nonferrous Metals. Robert I. Moore. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 465-469; disc., p. 469-470.
Previously abstracted from preprint. See item 187-E, 1950. (E10, EG-a)

131-E. Treatment of Bond Clays for Foundry Sand. A. E. Pavlish. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 492-501; disc., p. 501-502.
Previously abstracted from preprint. See item 186-E, 1950. (E18)

132-E. Standard Data for Bench Coremaking. H. R. Williams. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 503-509; disc., p. 509.
Previously abstracted from preprint. See item 184-E, 1950. (E21, CI)

133-E. Effect of Moisture on Core Sand Mixtures. O. Jay Myers. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 557-562; disc., p. 562-563.
Changes which occur in the physical properties of cores when the moisture content of the sand is varied. (E18)

134-E. Fayalite Reaction in Sand Molds Used for Making Steel Castings. Robert E. Savage and Howard F. Taylor. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 564-575; disc., p. 575-577.
Previously abstracted from preprint. See item 190-E, 1950. (E19, CI)

135-E. Nature of Mold Cavity Gases. Charles Locke and Richard L. Ashbrook. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 584-594; disc., p. 594.
Previously abstracted from preprint. See item 180-E, 1950. (E23, CI)

136-E. An Investigation of Metal Penetration in Steel Sand Cores. S. L. Gertsman and A. E. Murton. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 595-601; disc., p. 601-603.
Previously abstracted from preprint. See item 183-E, 1950. (E21, CI)

137-E. Reproducibility of Foundry Sand Tests. B. H. Booth, P. C. Rosenthal and H. W. Dietert. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 611-619; disc., p. 619-620.
Previously abstracted from preprint. See item 188-E, 1950. (E18)

138-E. Flowability of Molding Sands. William H. Moore. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 650-658; disc., p. 658-660.
Previously abstracted from preprint. See item 196-E, 1950. (E18)

139-E. Principles of Gating Design; Factors Influencing Molten Steel Flow From Finger Gating Systems. W. H. Johnson, W. O. Baker, and W. S. Pellini. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 661-668.
Previously abstracted from *American Foundryman.* See item 148-E, 1950. (E22, CI)

140-E. Cold Formed Flexible "Precision" Patterns and Core Boxes. R. B. Wagner and J. E. Wiss. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 675-679.
Previously abstracted from preprint. See item 201-E, 1950. (E17, T5, Al)

141-E. Production Patterns and the Matchplate. Robert F. Dalton. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 699-704.
Advantages and disadvantages of various types of pattern equipment. Economics of use of matchplates and the use of formulated metal-casting plaster in the matchplate industry. Possibility of applying the principles of the Al matchplate industry to other nonferrous foundry problems. 18 ref. (E17, Al)

142-E. Problems in Producing Ductile Iron. Max Kuniansky. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 705-709; disc., p. 709.
Raw materials and techniques for the treatment of cupola-melted metal with Mg alloys. (E25, CI)

143-E. Equipment for Degassing Magnesium Alloy Melts. Alex J. Juroff. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 715-716; disc., p. 717.
Previously abstracted from *American Foundryman.* See item 122-E, 1950. (E25, Mg)

144-E. An Alloy Designed for Pattern Shops. S. Zuckor. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 718-719; disc., p. 719.
Previously abstracted from preprint. See item 192-E, 1950. (E10, E11, Q general, Cu)

145-E. An Investigation of Melting and Casting Procedures for High Purity Nickel. Douglas W. Grobecker. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 720-727; disc., p. 727-728.
Previously abstracted from preprint. See item 191-E, 1950. (E10, E11, Ni)

146-E. Magnesium Foundry Practice in Canada. M. W. Martinson and

J. W. Meier. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 729-736; disc., p. 736-738.

Previously abstracted from preprint. See item 195-E, 1950. (E general, Mg)

147-E. Castings for Machine Tools. A. G. Thomson. *Foundry Trade Journal,* v. 90, Jan. 25, 1951, p. 101-104.

Ferrous and nonferrous foundry practice of British firm which specializes in production of machine tools. (E11, T5)

148-E. Low Frequency Melting of Aluminium Alloys; Birlec-Tama Furnaces at Rogerstone. *Metal Industry,* v. 78, Jan. 26, 1951, p. 63-64. (E10, Al)

149-E. Flat Patterns Made From an Improved Plaster. (In French.) Pierre Nicolas and Jacques Happich. *Fonderie,* Nov. 1950, p. 2237-2244.

Use of magnesia cement for plaster patterns. Method of preparation; physical, chemical, and mechanical properties. Details of use in the foundry. (E16)

150-E. Investigation of Cracks in Light-Alloy Castings. (In French.) André Tatur. *Fonderie,* Nov. 1950, p. 2245-2246.

Methods used by other investigators are summarized in tabular form. A new design of a test casting for this purpose. Results for the alloys A-U4NT and A-U5GT. 16 ref. (E25, Al, Mg)

151-E. Cracking, Loss of Toughness, and Strength of Gray Iron Castings. (In Czech.) E. Jekerle. *Hutnické Listy,* v. 5, Nov. 1950, p. 441-443.

The development of cracks in castings occurring at certain times like an epidemic. Investigation led to the conclusion that castings tend to crack when produced from pig iron produced at too high rates in the blast furnace. (E25, D1, CI)

F

PRIMARY MECHANICAL WORKING

22-F. Hot Working of Copper and Alloys. *Metal Progress,* v. 59, Jan. 1951, p. 116, 118, 120. (Condensed from paper by Maurice Cook and Edwin Davis).

Previously abstracted from *Journal of the Institute of Metals.* See item 60-F, 1950. (F general, Q23, Cu)

23-F. Kaiser's Newest Electric Weld Pipe Mill. Frank P. Cavenagh. *Western Machinery and Steel World,* v. 42, Jan. 1951, p. 76-79. (F26, CN)

24-F. New Methods for Manufacturing Boiler Fittings by Forging, Welding and Machining. K. Krekeler. *Engineers' Digest,* v. 11, Dec. 1950, p. 427-430. (Translated and condensed).

Previously abstracted from *Zeitschrift des Vereines Deutscher Ingenieure.* See item 295-F, 1950. (F22, G17, K1, T7, ST)

25-F. Hot-Breaking-Down Rolls for the Production of Aluminium Sheet. *Sheet Metal Industries,* v. 28, Jan. 1951, p. 12-15.

Equipment and details of recommended procedures. Causes of mosaic cracking of the sheet, roll-forging technique, heat treatment and finishing of rolls, and roll performance. (F23, Al, ST)

26-F. Nomograms for the Evaluation of Hitchcock's Formula for Roll Flattening. D. A. Winton. *Sheet Metal Industries,* v. 28, Jan. 1951, p. 16-17.

Presents the formula and nomograms. Construction and use of the latter. (F29)

27-F. Some Factors in the Design of Aluminium Assemblies With Particular Reference to Forming, Joining and Finishing. J. C. Bailey. *Sheet Metal Industries,* v. 28, Jan. 1951, p. 25-34.

Characteristics of the various processes and the properties of the alloys themselves, in so far as these affect design, both individually and in combination. (F22, G general, K general, L general, Al)

28-F. Continuous Strip Mill; An Important Development by Northern Aluminium Company Limited. *Automobile Engineer,* v. 40, Dec. 1950, p. 445-451.

Previously abstracted under similar titles. See item 267-F, 268-F and 287 through 292-F, 1950; and 4-F, 1951. (F23, Al)

29-F. 42-In. Slabbing Mill at Shotton. *Engineering,* v. 171, Jan. 5, 1951, p. 1-5.

British mill for producing steel slabs from ingots. (F23, ST)

30-F. Report of Rolling Experiences. Louis Moses. *Iron and Steel Engineer,* v. 28, Jan. 1951, p. 59-65, disc., p. 65-67.

How the roll designer applies his art on a scientific basis to solve operating problems. (F23)

31-F. Operating the World's Fastest Mill. Operations. J. R. Powell. **Control.** George A. Kaufman. *Iron and Steel Engineer,* v. 28, Jan. 1951, p. 73-80; disc., p. 80-82.

A number of novel and unusual design features first installed on rolling mill of Jones & Laughlin Steel Corp., Aliquippa, Pa., which is rated the fastest mill in the world. (F23, ST)

32-F. 19-Stand Rod Mill of Keystone Steel and Wire Co. William Herman. *Iron and Steel Engineer,* v. 28, Jan. 1951, p. 91-95.

By 2-stranding the roughing mill and 4-stranding the remainder, production of the above mill has been increased 150%. Includes layout diagram and mill data sheet. (F27, ST)

33-F. Electric Motors Over Three Hundred Horsepower Applied to Main Roll Drives in the Iron and Steel and Allied Industries During 1950. *Iron and Steel Engineer,* v. 28, Jan. 1951, p. 137-140.

A table. (F23)

34-F. Integrally-Stiffened Skin Revolutionizes Aircraft Construction; I. Forged Sections. II. Rolled and Cast Sections. III. Machined Sections. P. E. Sandorff and George W. Papen. *Iron Age,* v. 167, Feb. 1, 1951, p. 99-102; Feb. 8, 1951, p. 87-90; Feb. 15, 1951, p. 91-94.

Sheet material with integral stiffening ribs and other structural details is under investigation by the aircraft industry, intent on lowering production costs. Among the methods of producing such structures, forging offers many advantages. Huge presses and new forging techniques to produce integrally stiffened aircraft wing and fuselage structural panels. Part II: How the sheet is made by rolling-in stiffening ridges during processing of sheet stock. Many aircraft and other uses. Part III. Production by machining is attractive despite high chip loss. Use in experimental structures and models. (F22, F23, G17, T24)

35-F. Rolls and Rolling. Part XXII. Angles. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 39, Jan. 1951, p. 93-102, 104.

Roll passes for various types of angles. (F23)

36-F. Rolling and Mechanical Properties of Magnesium Alloy Sheet Containing 0-9.5% Aluminium. A. E. L. Tate. *Journal of the Institute of Metals,* v. 78, Sept. 1950, p. 71-92.

Rolling of cast Mg-alloy ingots into sheet and some mechanical properties of the sheet. The alloys contained 0-9.5% Al with 0.3% Mn. Comparative tensile properties of sheet produced by hot rolling alone and of sheet finished by cold rolling. (F23, Q general, Mg)

37-F. The New 42-In. Slabbing Mill at Shotton; Further Progress at the Hawarden Bridge Steel Works. *Metallurgia,* v. 42, Dec. 1950, p. 397-399. (F23, ST)

38-F. Wire-Drawing Research; Recent German Work on Alloy Steels. J. G. Wistreich. *Metal Treatment and Drop Forging,* v. 18, Jan. 1951, p. 22, 24. (F28, AY)

39-F. Discussion on the Paper: "The Compression Test in Relation to Cold Rolling," by N. H. Polakowski. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 305-314.

Covers paper published in Nov. 1949 issue (see item 19A-275, 1948). Includes author's replies. 14 ref. (F23, Q28)

40-F. The Hot Working of Stainless Steels. J. Lomas. *Machinery Lloyd* (Overseas Edition), v. 22, Dec. 23, 1950, p. 79, 81-82.

Recommended procedures. (F general, SS)

41-F. Recently Determined Relationships for Calculating the Lateral Expansion Caused by Rolling. (In German.) Ernst Cotel. *Stahl und Eisen,* v. 70, Dec. 21, 1950, p. 1219-1222.

Four approximation formulas for calculating lateral expansion. Comparison of calculated with experimental results shows the proposed formulas to be quite accurate. (F23)

42-F. Cold-Rolling of Steel. (In German.) Hans Bechmann. *Stahl und Eisen,* v. 70, Dec. 21, 1950, p. 1222-1223.

The ratio of expansion to thickness reduction depends on original thickness and width, radius of the rolls, and rolling rate. An approximation formula for calculating the above. Results for steel of several common values for width vs. roll-radius shown graphically. (F23, ST)

43-F. The Outlook for the Forging Industry. *Steel Processing,* v. 37, Jan. 1951, p. 17-19.

Economic analysis and forecast. (F22, A4, ST)

44-F. Increasing Drop Forging Die Life. Part II. John Mueller. *Steel Processing,* v. 37, Jan. 1951, p. 25-27.

Design recommendations. (F22)

45-F. Forge-Tapered Wing Spars Cut Airplane Weight 50 Pounds. *Steel,* v. 128, Feb. 19, 1951, p. 74.

Novelty of the new method lies in providing a bulb of aluminum in the web of what otherwise is an I-beam type extrusion. The extrusion is then forged in such a manner that the bulb is progressively flattened. After forging, the web tapers from 10 in. at one end to approximately 15½ in. at the other. (F22, T24, Al)

46-F. Cold Rolling Technique; The Application of Theory and Experiment to the Practice of Rolling. Methods of Calculating Roll Force and Torque Based on Theories of Rolling. (Series continued). Hugh Ford. *Sheet Metal Industries,* v. 28, Jan. 1951, p. 5-11, 18.

Assumptions made in early theories of rolling and interpretation of these theories. Orowan's general theory and its application to specific cases. Includes completely worked-out example. (To be continued.) (F23)

47-F. Works Practice on the Continent. *Sheet Metal Industries,* v. 28, Jan. 1951, p. 51-55; Feb. 1951, p. 158-160, 166.

Detailed report of the first continental tour organized by the Sheet and Strip Metal Users' Technical Association. Covers The Philips' Works, steels and deep drawing,

steel research, deep drawing of light alloys, impact extrusion, product finishing, press shops, hydraulic presses, working conditions, and other interesting research.
(F general, G general)

48-F. Flakes in Pieces of Steel. (In French.) Albert Portevin and Etienne Pretet. *Revue de Métallurgie*, v. 47, Dec. 1950, p. 889-893; disc., p. 893-894; *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 231, Nov. 27, 1950, p. 1188-1190; disc., p. 1191. (From document removed from sealed packet dated June 3, 1935.)

Factors responsible for flakes, including influence of structure, corrosion, and rate of cooling before forging. In the discussion, Pierre Chevenard points out the value of the ideas presented, although the role of hydrogen had not yet been recognized in 1935. (F22, M27, ST)

49-F. Contribution to the Study of Deformation of Special Steels During Rolling. (In French.) M. Cabane. *Revue de Métallurgie*, v. 47, Dec. 1950, p. 930-935; disc., p. 936.

Tabulated and charted data indicate that temperature of rolling is a more important factor than quality of the steel. Other factors involved. (F23, ST)

G

SECONDARY MECHANICAL WORKING

42-G. Machining and Hardening in the Same Setup. Joseph Geschelin. *Automotive Industries*, v. 104, Jan. 15, 1951, p. 50, 128.

Experimental setup for producing universal-joint bearing races and flanged bearing races on eight-spindle Conomatics. It is fitted with an induction hardening attachment, making possible not only the machining of these parts directly from bar stock but selective hardening as well in the same cycle.
(G17, J26, ST)

43-G. Metal Working Tools For High Production. S. K. Rudorf. *Metal Progress*, v. 59, Jan. 1951, p. 80-85.

Practical discussion of past developments and future prospects in tool materials, design, and other factors in increasing metal-cutting production, and in machining of very hard materials. (G17, T6)

44-G. For Best Enameling Results Coordinate Cleaner Drawing Compound. G. A. Cairns. *Ceramic Industry*, v. 56, Feb. 1951, p. 47, 49.

See abstract of "Advantageous Coordination of Metal Forming and Cleaning Operations," *Better Enameling*, item 35-G, 1951. (G21, L12, ST)

45-G. The Design and Manufacture of Woven Wire Fence. Julian L. Schueler. *Wire and Wire Products*, v. 26, Jan. 1951, p. 29, 31-39, 79-80.

Types of fences; types of wire used; weaving machines and methods. 29 ref. (G6, T10, ST)

46-G. Effect of Fluids on Tool Tip Temperatures. Joseph D. Pigott and Leonard P. Richardson. *Tool Engineer*, v. 26, Jan. 1951, p. 35-37.

Apparatus for determination of tool tip temperatures. Results of tests made on a Monarch lathe, using SAE 1015 plug-pierced seamless tubing as workpieces and 18-4-1 high speed steel for tools.
(G17, CN, TS)

47-G. Experience With Machinability Repeat-Ability. E. J. R. Hudec. *Transactions of the American Society of Mechanical Engineers*, v. 73, Jan. 1951, p. 17-19, disc., p. 19-20.

Experiences with certain phases of the machinability problem, and a means by which repeat test runs can be made to give more consistent results. (G17)

48-G. A Study of Heat Developed in Cylindrical Grinding. R. E. McKee, R. S. Moore, and O. W. Boston. *Transactions of the American Society of Mechanical Engineers*, v. 73, Jan. 1951, p. 21-33, disc., p. 33-34.

Fourth of a series on cylindrical grinding. Results of an investigation of the grinding process with particular reference to the influence of grain size of a grinding wheel and type of grinding compound on volume of metal removed per unit of wheel wear, unit net horsepower, surface finish, grinding rating, temperature increase in the workpiece surface, temperature increase in the grinding compound, and possible injury to structure of the metal. Specimens were SAE 52100 steel, subjected to a definite preliminary heat treatment schedule.
(G18, AY)

49-G. Machining of Heated Metals. E. T. Armstrong, A. S. Cosler, Jr., and E. F. Katz. *Transactions of the American Society of Mechanical Engineers*, v. 73, Jan. 1951, p. 35-42, disc., p. 42-43.

Previously abstracted from *American Society of Mechanical Engineers*, Paper 50-S-5, 1950. See item 288-G, 1950. (G17, AY, SS, TS, Co)

50-G. The Effect of the Cutting Fluid Upon Chip-Tool Interface Temperature. M. C. Shaw, J. D. Pigott, and L. P. Richardson. *Transactions of the American Society of Mechanical Engineers*, v. 73, Jan. 1951, p. 45-52, disc., p. 52-56.

Analyzes the short-circuiting effect of a cutting fluid in conjunction with chip-tool interface temperature measurements by the tool-work thermocouple technique. An experimental arrangement based upon results of this analysis is capable of giving reliable cutting temperatures in the presence of fluids. Representative water-base cutting fluids become less effective in reducing cutting temperature as volume of metal removed per unit time is increased. Workpiece material was SAE 1015 plug-pierced seamless tubing. Tool material was 18-4-1 high-speed toolsteel. 11 ref. (G17, CN, TS)

51-G. An Analytical Evaluation of Metal-Cutting Temperatures. K. J. Trigger and B. T. Chao. *Transactions of the American Society of Mechanical Engineers*, v. 73, Jan. 1951, p. 57-66, disc., p. 66-68.

Average tool-chip interface temperature is calculated by considering the mechanism of heat generation during metal-cutting operations in which a "type 2" chip is formed. Analytical results agree well with those obtained experimentally. 18 ref. (G17)

52-G. Discussion on Presswork Production; An Examination of the Technique of Using Progressive Tools. R. Kirchner and G. V. Bevan. *Sheet Metal Industries*, v. 28, Jan. 1951, p. 41-42, disc., p. 42-50, 55.

Author's introduction plus extensive discussion. (G1)

53-G. Tools for the Job. *Aeroplane*, v. 80, Jan. 5, 1951, p. 13-17.

Two recent developments in aircraft manufacturing—spin-dimpling and squeeze-riveting.
(G2, K13, Al)

54-G. Hot Pressing of Brasses. R. W. N. Danielson. *Metal Industry*, v. 77, Dec. 29, 1950, p. 315-318.

The process and some of its applications. Compositions suitable for the process and for different uses. Types of dies used and die sinking operations. (G1, G16, Cu)

55-G. Fundamentals of the Working of Metals. Part 19. George Sachs. *Modern Industrial Press*, v. 13, Jan. 1951, p. 6, 8, 55.

Classification of shearing methods and distortion-caused defects during shearing. (G15)

56-G. Hot Machining of Many Metals Improved by Arc Heating. E. T. Armstrong and A. S. Cosler. *Materials & Methods*, v. 33, Jan. 1951, p. 69-73.

Metal cutting at elevated temperatures using arc heating has resulted in improved machinability, longer tool life, and the machining of metals previously difficult to machine.
(G17)

57-G. Application of Metal Cutting Research to Shop Practice. Part II. Max Kronenberg. *Modern Machine Shop*, v. 23, Feb. 1951, p. 100-104, 106, 108, 110.

Practical methods for determining proper machining feeds and speeds. (G17)

58-G. Steam Coil Fabrication Combines Latest Forming, Welding Methods. Dan Reebel. *Steel*, v. 128, Feb. 5, 1951, p. 76-78.

Equipment and procedures used to fabricate steam coils for steam-generating plants used to heat diesel-powered passenger trains. Tubing is made of ASME A-83 seamless steel tubing.
(G general, K2, T27, ST)

59-G. Mass Production. Component and Circuit Die Stamping. Ralph G. Peters. *Tele-Vision Engineering*, v. 2, Jan. 1951, p. 10-11, 23-25.

Die stamping of circuit wiring and a variety of components out of sheets of conducting materials, which are simultaneously attached to a sheet of insulating material. The method overcomes limitations of hand procedures in assembly, wiring, soldering, and testing. It was found to minimize maintenance of completed units and to provide assurance of peak performance. (G3)

60-G. Grinding Fluids; Characteristics and Applications. H. W. Wagner. *Mechanical Engineering*, v. 73, Feb. 1951, p. 128-132.

Classifies fluids with reference to composition. Positive and negative functions of fluids; types of fluids rated with regard to ability to fulfill the functions. A theory of the benefit of lubrication to grinding; correlated with lubrication from the fluid with surface finish on the work. Data from experimental grinding. (G18, G21)

61-G. Automatic Flame Gouging. *Industry & Welding*, v. 24, Feb. 1951, p. 56, 69.

Specially designed nozzles, a double torch, and ordinary turning rolls, have mechanized some applications to provide efficient automatic gouging at M. W. Kellogg Co., Jersey City, N. J. (G22, CN)

62-G. From Bolts to Nuts. Richard Cheney. *Steelways*, v. 7, Jan. 1951, p. 20-22.

Story of their production.
(G2, G10)

63-G. Edge Preparation for Welding. C. A. Heffernon. *Canadian Metals*, v. 14, Jan. 1951, p. 32-34, 36.

Modern production welding requires various types of edge preparation. To carry out this operation rapidly and economically, ingenious mountings for oxygen-cutting equipment have been devised. Describes examples applied to mass-production in Canada and the U. S.
(G22, K general)

64-G. Spin-Dimpling. *Aircraft Production*, v. 13, Jan. 1951, p. 3-7.

New cold process for producing a close-tolerance countersunk form for flush riveting developed by Bristol Aeroplane Co., Ltd., in Britain.
(G2)

65-G. Shearing of Metal Bars. T. M. Chang and H. W. Swift. *Journal of the Institute of Metals,* v. 78, Oct. 1950, p. 119-146.

Stresses, metal flow, and crack propagation in the shearing of ½-in. thick bars of most industrial metals were studied. It was found that there are two chief modes of fracture in shearing without clearance, differing for ductile and other materials. Clearances up to 30% of the metal thickness were investigated. Effects of dullness of cutting edge and of tensile overstrain were also studied. 10 ref. (G15, Q26)

66-G. Problems of Metal-Cutting Research. (In German.) E. Brödner. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 92, Dec. 21, 1950, p. 1021-1025.

Reviews literature on the theory of metal cutting and the relationships between metal properties and structures, machine-tools used, cutting speeds, etc. 69 ref. (G17)

67-G. Electromechanical Method of Cutting Metal During Fine Machining. (In Russian.) B. M. Askinazi. *Promyshlennaya Energetika* (Industrial Power), v. 7, Oct. 1950, p. 9-10.

Method is based on simultaneous utilization of two sources of heat: that formed by deformation and friction during removal of chips; and auxiliary heat supplied by an electric current to the zone of cutting. Addition of internal cooling to the cutting wheel is also recommended. Schematic diagrams illustrate details of equipment. Optimum conditions of operation. (G17)

68-G. Preparation of Edges of Sheet Steel for Welding by Means of Gas Cutting. (In Russian.) A. K. Krzhechkovskii. *Avtogennoe Delo* (Welding), v. 21, Oct. 1950, p. 27-30.

Problem was investigated to establish basic procedures and production setups and to determine optimum conditions of cutting low-alloy steel 10-100 mm. thick. Both V-shaped and X-shaped sheet edges were investigated. (G22, K2, CN)

69-G. Influence of Preliminary Cold Working of Aluminum on Effectiveness of Surface-Active Liquids Applied During Cutting. (In Russian.) G. I. Epifanov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Dec. 1, 1950, p. 555-557.

Investigated on commercial Al annealed at 400° C for 1 hr., slowly cooled, then cold rolled, using butyl alcohol as the surface-active liquid. Data indicate that during cutting of metals having different plasticities, or of individual metals with different degrees of plasticity induced by cold working, effectiveness of surface-active liquids decreases during transition to more brittle metals or brittle states of the same metal. (G21, Al)

70-G. Stepped Diameter Parts Extruded to Close Tolerances. *Automotive Industries,* v. 104, Feb. 15, 1951, p. 50, 104.

Extrusion of parts such as transmission shafts, studs, and other formed automotive parts from steel bars and slugs has been a specialty of Molloy Mfg. Co., Detroit. The technique appears to be applicable to many similar parts for military requirements. (G5, ST)

71-G. Die Life Can Be Increased. F. J. Henkel. *Production Engineering & Management,* v. 27, Feb. 1951, p. 66-69.

Procedures for the manufacture and servicing of dies, which will provide greater die life by increasing and equalizing the number of hits obtainable between grinds. Analysis is based on physical tests and research carried on over a period of several years. (G1)

72-G. Streamlined Production: Tailor-Made Products Mass Produced. *Production Engineering & Management,* v. 27, Feb. 1951, p. 71-78.

Procedures and equipment for production of complex nameplates and insignia. Al and its alloys are used for 90% of the items, although ferrous and other nonferrous alloys are also worked. Forming, finishing, and welding are the principal procedures.
(G3, K general, L general, T9, Al)

73-G. Special Nail is Formed and Upset Rapidly. E. A. Eliason. *Wire and Wire Products,* v. 26, Feb. 1951, p. 135-136.

Operations used in forming special nails. Eight operations performed in rapid sequence include notching the wire and formation of a half head on each end. (G10, CN)

74-G. An Investigation of the Flow and Effect of a Cutting Oil in Machining Operations. W. E. Lauterbach and E. A. Ratzel. *Lubrication Engineering,* v. 7, Feb. 1951, p. 15-19.

Investigation on certain cutting operations conducted at surface speeds between 2½ and 200 ft. per min. For very low cutting speeds (below approximately 10 ft. per min. for the particular cutting conditions employed), the cutting oil penetrates between the tool and workpiece and between the tool and chip, entering from the clearance crevice and not from the rake crevice. At higher cutting speeds penetration of the oil between tool and workpiece and between tool and chip from either crevice could not be detected by the method used. (G17, G21)

75-G. Machining the Stainless Steels. Lester F. Spencer. *Tool & Die Journal,* v. 16, Jan. 1951, p. 52-53, 61, 64, 68, 116; Feb. 1951, p. 70-71, 83.

Machining characteristics of the various types; recommended machining speeds. Machine tool setups for typical stainless steel parts. Feb. issue: hollow mills; box tools; knee tools; tool selection; grinds; finish; chip curlers; circular tools; forming tools; and swing tools. (To be continued.) (G17, SS)

76-G. Applications of Carbide Cutting Tools to Cost Reduction and High Production. J. R. Miller. *Tool & Die Journal,* v. 16, Feb. 1951, p. 74, 76, 78, 134.
(G17, T6, C-n)

77-G. West Coast Metalworking Progress in 1950. Thomas A. Dickinson. *Steel Processing,* v. 37, Jan. 1951, p. 20-22, 43, 49.

Processing equipment and developments installed by various firms. Includes stretch-wrap forming, machining, grinding, pipe production, welding, heat treating and others.
(G general)

78-G. Oxygen Cutting Processes in Steel Foundries. R. S. Babcock. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 346-357; disc., p. 357-358.

Previously abstracted from preprint. See item 155-G, 1950.
(G22, E24, CN, SS)

79-G. Bandsawing in Foundries. Geo. H. Sheppard. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 621-625.
(G17, E general)

80-G. Manipulation of Corrosion and Heat Resisting Steels. Techniques for Machining, Shearing and Pressing. J. A. McWilliam. *Welding & Metal Fabrication,* v. 19, Jan. 1951, p. 19-24.
(G17, G1, G15, SS, SG-g, h)

81-G. A Review of Equipment Used in the Manufacture of Tin Boxes. G. Taylor. *Sheet Metal Industries,* v. 28, Jan. 1951, p. 35-38.

First of series covering sheet metals less than 0.015 in. Treadle-operated shears and gang slitting machines. (To be continued.) (G15)

82-G. Fabricating Large Steel Pipes. *Machinery* (London), v. 78, Jan. 18, 1951, p. 91-97.

Equipment and procedures of Basalt Rock Co., Napa, Calif. Operations include shearing, chemical cleaning and descaling, forming, and arc welding.
(G15, G6, L12, K1, CN)

83-G. (Book) Hard Metals. E. Hirschfeld. 264 pages. Schweizer Druck- und Verlagshaus A. G., Zurich 8, Switzerland. 29s.

A comprehensive publication on machining with sintered carbide tools and the development and application of hard metals in general. First published in Czech. A survey of Continental practice with carbide tools. Contains an extensive bibliography as well as a name and subject index. 113 ref. (G17, T6, C-n)

H

POWDER METALLURGY

5-H. Sintering of Iron. (In French.) M. Eudier. *Revue de Métallurgie,* v. 47, Nov. 1950, p. 825-834.

The powder metallurgy of pure iron. Investigations of sintering methods and effects of various factors. (H15, Fe)

6-H. Mechanical Properties of Stainless Steel Powder. Arthur H. Grobe and George A. Roberts. *Journal of Metals,* v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 125-130.

Tensile, hardness and density of a new 18-8 stainless-steel powder were determined for the −50, −100, and −140 mesh cuts and also for a prepared blend containing 62% −325 mesh powder. The data were obtained for sintering temperatures of 2100-2350° F. and for compacting pressures of 30-50 tons per sq. in.
(H11, Q27, Q29, SS)

7-H. Some Design Aspects of Metal-Powder Parts. D. C. Bradley. *Mechanical Engineering,* v. 73, Feb. 1951, p. 123-127.

Methods used for production of metal powders and for their fabrication into desired parts. Physical and mechanical properties of the parts and principles of design. Typical applications. (H general, T7)

8-H. Experimental Study on the Kinetics of Sintering of Metal Powder at Constant Temperature. I. (In English.) Tosihiko Okamura, Yosimichi Masuda, and Sadao Kikuta. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Dec. 1949, p. 357-363.

Isothermal changes of breaking strength and shrinkage of sintered metals were measured for Cu and Fe at various temperatures keeping other conditions constant. From the experimental results, some empirical formulas for rate of sintering were derived as a function of time and temperature with respect to porosity of the sintered metal. Activation energies for sintering of the metal powders studied are estimated from temperature dependence of rate of shrinkage. 23 ref.
(H15, P13, Cu, Fe)

9-H. Hot Pressing Produces High-Strength Carbides. *Tool & Die Journal,* v. 16, Feb. 1951, p. 72-73, 100, 106.

The procedure, its advantages and applications. Instead of cold compaction followed by a subsequent sintering operation, the mixture of WC and Co particles is poured into

the cavity of a special graphite mold where the powder mass, while being heated to a temperature of about 2600° F, is compressed in a special pressure-temperature-time controlled operation. (To be continued.) (H14, C-n)

10-H. The Practicability of Powder Metallurgy. Samuel Bradbury, III. *Electrical Manufacturing,* v. 47, Feb. 1951, p. 84-89, 226, 228.

Powder metallurgy techniques often lend themselves to economical production, particularly where machined parts require assembly. Table of cost factors for six methods for making custom metal parts, and table of physical properties of some common powdered-metal alloys. Typical case histories. (H general, T7)

11-H. Rolling of Strip From Iron Powder. G. Naeser and F. Zirm. *Engineers' Digest,* v. 12, Jan. 1951, p. 17-20. Translated and condensed.) **Steel Strip Experimentally Rolled From Powder.** Gerhard Naeser and Franz Zirm. *Iron Age,* v. 167, Feb. 1, 1951, p. 110-114; Feb. 15, 1951, p. 95-99.

Previously abstracted from *Stahl und Eisen.* See item 104-H, 1950. (H14, Fe)

J HEAT TREATMENT

30-J. Improvements in Furnaces and Methods for Heat Treatment. Floyd E. Harris. *Metal Progress,* v. 59, Jan. 1951, p. 62-68.

Reviews a decade of progress. (J general)

31-J. Annealing of Ti and Zr. A. M. Bounds and H. W. Cooper. *Metal Progress,* v. 59, Jan. 1951, p. 69, 100, 102.

Procedures. Concludes that annealing in air or a non-inert atmosphere produces scaling and surface hardness which cannot be eliminated by descaling or pickling. Inert atmospheres give satisfactory protection but are quite expensive, especially for large parts, wire, or tubing. Recommends vacuum annealing for light parts; and molten-caustic descaling. (J23, L12, Ti, Zr)

32-J. Steel Castings; A Review of the Literature on Homogenisation. A. Hartley. *Iron and Steel,* v. 23, Dec. 1950, p. 511-514.

17 references. (J21, CI)

33-J. Influence of Gaseous Atmospheres on Formation of Bubbles in Beryllium Bronze. (In Russian.) A. K. Chertavskikh and Yu. A. Klyachko. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Oct. 1950, p. 1032-1039.

Experimental investigation showed that bubbles form, during heat treatment, upon attaining a critical temperature of 800-810° C., and that formation proceeds especially vigorously in an atmosphere containing H_2O or NH_3. Mechanism of bubble formation is explained on the basis of initiation, at the critical temperature, of a self-propagating chain reaction of dissociation of steam adsorbed on the external and internal surfaces of the metal, releasing hydrogen. Test specimens are illustrated showing bubble formation. (J23, Cu)

34-J. Effect of Heating Rate on Graphitization of White Iron. Masazo Okamoto. *Foundry,* v. 79, Feb. 1951, p. 101.

Results of recent Japanese investigations, comparing them with those of Palmer and of Schneidewind. (J23, N8, CI)

35-J. Liquid Flame Hardening Used to Selectively Harden Steel Gear Teeth. T. C. Du Mond. *Materials & Methods,* v. 33, Jan. 1951, p. 74-75.

Use of a molten salt bath and a simple fixture solved the problem of locally heat treating alloy steel gears after other methods proved unsatisfactory. (J2, AY)

36-J. Harley-Davidson Meets Higher Production Schedules. Arthur Q. Smith. *Industrial Gas,* v. 29, Jan. 1951, p. 3-6, 25-26.

How modern furnaces treat parts requiring special metallurgical characteristics in motorcycle production. Other uses of gas-fired furnaces in production of motorcycle parts. (J general, L general, ST)

37-J. Practical Toolmaking, Part II. J. Y. Riedel. *Modern Machine Shop,* v. 23, Feb. 1951, p. 116-120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142.

Distortion of toolsteel during heat treatment and its prevention. (J general, TS)

38-J. Electric Furnaces Provide Savings in Producing Malleable Castings. *Modern Machine Shop,* v. 23, Feb. 1951, p. 222, 224, 226.

Annealing furnaces of National Malleable and Steel Castings Co. (J23, CI)

39-J. The Aging of Sand-Cast Mg-Al-Zn Alloys. T. E. Leontis and C. E. Nelson. *Journal of Metals,* v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 120-124.

Aging studies on AZ63A and AZ92A show that a wide variation in mechanical properties can be attained by selection of aging temperature and time. 14 ref. (J27, Q general, Mg)

40-J. Induction Heating. Ed Bukstein. *Radio & Television News,* v. 45, Feb. 1951, p. 35, 92-93.

Apparatus and its application to various metal-fabricating procedures. (J2)

41-J. Ford Bushings Heat Treated Efficiently in Furnaces With Rotary Retorts. *Industrial Heating,* v. 18, Jan. 1951, p. 30-34, 36. (J general, ST)

42-J. High Speed Heating of Steel. M. H. Mawhinney. *Industrial Heating,* v. 18, Jan. 1951, p. 40-44, 172, 174, 176.

Examines a number of different furnaces whose rate of heating exceeds 100 lb. per hr. A relationship between heat transfer and heating rate, and information to assist evaluation of this method of heating. A table shows pertinent data on seven furnaces heating cold steel and one steel which had been preheated to 1250° F. (J general, F21, ST)

43-J. Annealing of Malleable Iron Castings in Electric Furnaces Effects Substantial Savings at National Malleable. *Industrial Heating,* v. 18, Jan. 1951, p. 46-48.

Equipment and procedures. (J23, CI)

44-J. Mass Marquenching Speeds Gear Output. W. B. Cheney and W. C. Hiatt. *Steel,* v. 128, Feb. 12, 1951, p. 72-74.

Rearranged and modernized heat treating facilities of International Harvester Co. at the Ft. Wayne Works. Five radiant-tube gas carburizers are used to marquench alloy steel transmission gears, differential side gears, side pinion gears, king pins, and miscellaneous shafts. Results of comparative study of regular quenching and marquenching. (J26, T7, AY)

45-J. Salt Bath Quenching of Steel. *Heat Treating,* v. 1, Dec. 1950, p. 8-9.

Recommended heating and quenching media and their applications to carburizing of steel. (J2, J28, ST)

46-J. Safe Handling of Cyanide Type Heat Treating Salts. *Heat Treating,* v. 1, Dec. 1950, p. 14-15, 19.

Recommendations. (J2)

47-J. Heat Treatment Plant for the English Needle Industry. *Heat Treating,* v. 1, Dec. 1950, p. 16-17. (From *Wire Industry,* Aug. 1950.) (J26, ST)

48-J. Modern Heat-Treatment Furnaces With Special Reference to Town's Gas Firing. L. G. A. Leonard. *Metal Treatment and Drop Forging,* v. 18, Jan. 1951, p. 25-32.

Some of the various types of burners and furnaces available for heat treatment processes. (J general)

49-J. Stress Relief and Allied Problems in Magnesium Alloy Castings. R. J. M. Payne. *Journal of the Institute of Metals,* v. 78, Oct. 1950, p. 147-168.

A method by which degree of stress relief resulting from any given annealing treatment may conveniently be evaluated. The method is capable of general application to stress-relief annealing problems and has been used to establish suitable conditions of treatment for a number of Mg and Al base casting alloys. Problems associated with heat treatment of four Elektron casting alloys for stress removal (Mg-Al alloy AZ91; Mg-Al alloy A8; the Mg-Zn-Zr alloy Z5Z; and Mg + rare-earth + Zr alloy MCZ). (J1, Mg)

50-J. Stress-Ageing Treatment and Its Effects on the Physical Properties of Copper-, Iron-, and Aluminium-Base Alloys. R. F. Gill, E. A. Smith, and R. H. Harrington. *Journal of the Institute of Metals,* v. 78, Nov. 1950, p. 203-228.

"Stress-aging" is a treatment which consists of heating an alloy, for the correct time and at a suitable temperature, while it is subjected to a specific stress from an external load. By this treatment it is possible, in alloys that possess recrystallization temperatures effectively above room temperature, to double and almost treble the elastic properties, to increase tensile strength, and simultaneously to raise the elongation and electrical conductivity. Results of extensive experimental work on the treatment as applied to 8 Cu-base, 5 Fe-base, and 11 Al-base alloys. Effects on microstructures. (J27, Q general, Cu, Fe, Al, SS)

51-J. Arc Surface Hardening. (In Russian.) K. K. Khrenov and G. V. Vasilev. *Avtogennoe Delo* (Welding), v. 21, Oct. 1950, p. 1-5.

Experimental work on hardening the working surfaces of rails which had been in service a long time. Possibility of heating metal by a direct carbon arc without melting the surface was confirmed. Details of arc heating procedure. Data for designing an industrial installation. (J26, J2, ST)

52-J. New Method of Gaseous Carburization. (In Russian.) L. E. Semina, V. A. Rzhepetskogo, and N. I. Chetyrina. *Promyshlennaya Energetika* (Industrial Power), v. 7, Oct. 1950, p. 11-12.

The carburizing gas is generated in the chamber of the carburization furnace itself and liquid combustibles are not required. The carburizing mixture contains 70% coal, 10% dry sawdust, and 20% calcined soda. Holding in the furnace 1 hr., 20 min. at 920° C. gives a 0.4-0.6-mm. carburized layer. Furnace details are shown schematically. (J28, ST)

53-J. The Problem of Deformation of Steel During Thermochemical Treatment. (In Russian.) *Vestnik Akademii Nauk SSSR* (News of the Academy of Sciences of the USSR), v. 20, Oct. 1950, p. 112-113.

The work of S. F. Yurev on internal reactions in steel between

carburized and nitrided layers and core metal. (J28, ST)

54-J. Spheroidization of Eutectoidal Cementite in White Cast Iron. (In Polish). P. Piaskowski. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa*, v. 2, no. 4, 1950, p. 269-272.

The spheroidization process and properties obtained by it. A theory according to which the accelerated process of cementite spheroidization occurs in hypereutectoid Fe-C alloys due to formation of spheroidization nuclei at temperatures above the critical temperature range. The cementite of the eutectoid mixture that results from decomposition of austenite crystallizes on these nuclei. (J23, N8, CI)

55-J. Internal Stress Due to Quenching in Cylindrical Steel Ingots. (In English.) Tokutaro Hirone and Noboru Tsuya. *Science Reports of the Research Institutes, Tohoku University*, ser. A, v. 1, Oct. 1949, p. 169-173.

Mathematical analysis and graphical representation of the results. (J26, Q25, ST)

56-J. Flame Hardening of Large Surfaces. J. J. Barry. *Welding Journal*, v. 30, Feb. 1951, p. 111-116.

Fundamental principles, historical development, and modern methods and applications. (J2)

57-J. Surface Hardening of Pearlitic Malleable Irons. S. H. Bush, W. P. Wood, and F. B. Rote. *Transactions of the American Foundrymen's Society*, v. 58, 1950, p. 108-121; disc., p. 121.

Previously abstracted from preprint. See item 106-J, 1950. (J26, CI)

58-J. A Summary of the Quantitative Effects of Some Factors on the Annealing of White Cast Iron. Richard Schneidewind. *Transactions of the American Foundrymen's Society*, v. 58, 1950, p. 202-207; disc., p. 207.

Effect of soaking temperature, temper-carbon form, method of heating, superheat deoxidation, and Si and C content on annealing rate. 15 ref. (J23, CI)

59-J. Furnace Atmosphere for Malleable Annealing. W. D. McMillan. *Transactions of the American Foundrymen's Society*, v. 58, 1950, p. 365-373; disc., p. 373-375.

Previously abstracted from preprint. See item 105-J, 1950. (J23, CI)

60-J. Annealing of Monel, Nickel and Inconel. I. Various Methods Described and Illustrated. *Wire Industry*, v. 18, Jan. 1951, p. 53-55.

(To be continued.) (J23, Ni)

61-J. The Surface Hardening of Steel. Part I. Methods and Practices. G. T. Colegate. *Metal Treatment and Drop Forging*, v. 18, Jan. 1951, p. 5-12.

Introductory résumé of case hardening methods generally applied in industry, followed by a discussion of the function and properties of the case and core. (To be continued.) (J28, ST)

62-J. Modern Heat-Treatment Furnaces. L. G. A. Leonard. *Foundry Trade Journal*, v. 90, Jan. 25, 1951, p. 89-94. (A condensation).

The laws of heating and heat transmission, development of refractories, insulation, burners, and recuperation. Details of commercial gas-fired furnaces of various types. (J general)

63-J. Heat Treatment of Light Alloys; Quenching and Annealing. (In French.) Paul Penel. *Revue de l'Aluminium*, v. 27, Oct. 1950, p. 385-390.

The series of operations which constitute the heat treatment itself. Importance of the conditions in which they should be carried out. (To be continued.) (J23, J26, Al)

64-J. Heat Treatments Accompanying Cementation. (In French.) J. Pomey. *Revue de Métallurgie*, v. 47, Nov. 1950, p. 789-804; Dec. 1950, p. 895-906.

Confined to carburizing and nitriding of steel. Comprehensive descriptive review of the literature on the subject. 47 ref. (J28, ST)

65-J. (Book) **Heat-Treatment Fundamentals.** S. Collard Churchill. 66 pages. Machinery Publishing Co., Ltd., National House, West St., Brighton 1. England. (Machinery's Yellow Back No. 26). 3s., 6d.

Elementary description of the metallurgical knowledge necessary for understanding the practical processes of heat treatment. Transformations involved are described. Emphasis is on steel. (J general, N8, ST)

K

JOINING

66-K. Make Repair Welds on Large Gray Iron Castings. John H. Walsh. *American Foundryman*, v. 19, Jan. 1951, p. 52-55.

Attempts to repair faulty large-size castings, such as diesel engines and hydraulic equipment, at the plant of Dominion Engineering Works Ltd., Lachine, Quebec. A series of tests was run to determine what could be expected of cast iron welds and the most suitable equipment for the job. (K1, K2, CI)

67-K. Prepared Pastes for Brazing Material. L. G. Klinker. *Metal Progress*, v. 59, Jan. 1951, p. 70-73.

Disadvantages of current methods for application of brazing material in furnace brazing of steel assemblies. Recommends use of metallic pastes and gives figures to show that they are not too expensive. Use of "Cubond" types 151, 153, and 155. (K8, ST)

68-K. Soft Soldering in Production. Charles H. Yetman. *Metal Progress*, v. 59, Jan. 1951, p. 74-75.

How costs were reduced and operations speeded up in production of cigarette lighters from brass. (K7, Cu)

69-K. Bellows Production at Solar Aircraft Company. Eugene H. Ziebold. *Western Machinery and Steel World*, v. 42, Jan. 1951, p. 72-74.

Semi-automatic arc welding of stainless steel and superalloy bellows for jet engines, also bellows of ordinary steel for industrial expansion joints. (K1, ST)

70-K. Aircomatic Welding of Copper-Base Alloys. Harold Robinson and John H. Berryman. *Welding Journal*, v. 30, Jan. 1951, p. 7-25.

General investigation of the weldability of several Cu-base alloys using the gas-shielded metal-arc process. Mechanical properties of a few simple welded joints with a number of electrode-filler materials. Several practical applications. (K1, Cu)

71-K. General Procedures for Fabrication of Pressure Vessels. S. V. Williams. *Welding Journal*, v. 30, Jan. 1951, p. 26-32.

A tentative procedure for fabrication by welding. Special attention is devoted to drawings, specifications, material, layout, forming, fittings, assemblies, welding, inspection, stress relieving, and final testing. (K1, J1, S22, T26)

72-K. Welding Stainless Steel Containers to Meet Sanitary Standards. P. H. Mounts. *Welding Journal*, v. 30, Jan. 1951, p. 33-39.

History of dairy machinery and containers. Equipment and procedures of Cherry-Burrell Corp., Cedar Rapids, Iowa for oxy-acetylene, resistance and arc welding. Special attention must be paid to production of welds free of pits and irregularities which would make the equipment difficult to clean properly. (K1, K2, K3, T29, SS)

73-K. Sun Supertankers. A. A. Holzbaur and F. L. Pavlik. *Welding Journal*, v. 30, Jan. 1951, p. 40-48.

Tankers of 26,000-27,000 tons dead weight. Details of structural arc welding procedures. (K1, T22, CN)

74-K. Welding Aluminum With Inert Arc D. C. *Welding Journal*, v. 30, Jan. 1951, p. 49-52.

Glenn J. Gibson discusses above paper by John W. Mortimer (Oct. 1950 issue, see item 642-K, 1950.) Points out other desirable advantages and applications. (K1, Al)

75-K. Crack Sensitivity in Aircraft Steels. *Welding Journal*, v. 30, Jan. 1951, p. 52-53.

C. E. Sims discusses above paper by A. W. Steinberger, B. J. DeSimone, and J. Stoop (Sept. 1950 issue; see item 565-K, 1950). Includes authors' reply. (K9, T5, T24, AY, SS)

76-K. Backhand Welding of Pipe. J. W. Carrier. *Welding Journal*, v. 30, Jan. 1951, p. 54-55.

Recommended procedures, using the oxy-acetylene torch. Advantages. (K2, CN)

77-K. Economies Accomplished by Redesign for Welding. K. H. Jackson. *Welding Journal*, v. 30, Jan. 1951, p. 56-58.

Several jobs are selected to illustrate conservation of materials and reduction of manufacturing costs and how they can be brought about by welded design. (K general)

78-K. Prolonging Tungsten Electrode Life. *Welding Journal*, v. 30, Jan. 1951, p. 59-60.

Longer electrode life, better welds, labor saving, lower welding costs will result from following simple instructions given by Fansteel Metallurgical Corp., North Chicago, Ill. (K1, T5)

79-K. Welding Procedures for High-Pressure, High-Temperature Steam Piping. N. L. Navarre. *Welding Journal*, v. 30, Jan. 1951, p. 1s-9s.

Development of welding procedures for alloy and stainless steels intended for this service, including preheat and postheat treatments for various alloy combinations, electrode selection, and thermal-shock fatigue tests. (K1, J1, AY, SS, SG-h)

80-K. Rotating Electrode in Manual Metal Arc Welding. Gilbert S. Schaller. *Welding Journal*, v. 30, Jan. 1951, p. 10s-14s.

Holder developed to facilitate striking the arc. The electrode is rotated, thereby providing greater facility not only for striking but for maintaining the arc in metal-arc welding. Photographs illustrate results obtained by the two methods, by novice welders. (K1)

81-K. Welding High-Temperature Austenitic Steel Piping. R. W. Emerson and Matthew Morrow. *Welding Journal*, v. 30, Jan. 1951, p. 15s-33s, disc., p. 33s-39s.

Results obtained on three welds made in Type 347 material, 8⅝-in. o. d. by 1-in. wall, forged-and-bored. One was welded manually, and two by the submerged-arc process. Welding procedure, mechanical properties of test welds, effects of stabilizing heat treatments and of quench annealing on mechanical properties, determination of ferrite content of weld deposits, time-temperature relation in the conversion of ferrite to sigma, and microfissures in submerged-arc 19-9CB weld deposits. 38 ref. (K1, J23, N8, SS, SG-h)

82-K. Aluminum-Magnesium Filler Metals for Welding High-Strength Aluminum Alloys. D. C. Martin and R. D. Williams. *Welding Journal*, v. 30, Jan. 1951, p. 55s-58s.

It was found that welds made with 8-10% Al-Mg alloy rods have double the yield strength of welds made with 43S filler metal using argon-shielded tungsten-arc welding to join 61S, 24S and 75S Al-alloy plates. The alloys investigated contained 5-15% Mg. (K1, Al)

83-K. Gas and Smoke Resulting From the Welding of Ferrous Materials. (In German.) *Schweisstechnik*, v. 4, Nov. 1950, p. 121-130.

Laboratory and large-scale experiments were made to study the composition of the gases, smokes, and vapors arising from gas and electric welding, their effect on health, and methods of protection. 17 ref. (K1, K2, A7, Fe, ST)

84-K. Study of Bonded Units. J. M. Buist, C. H. Lindsey, W. J. S. Naunton, R. L. Stafford, and G. E. Williams. *Industrial and Engineering Chemistry*, v. 43, Feb. 1951, p. 373-381.

Work was undertaken because no satisfactory and discriminating test was available for evaluating rubber-to-metal bonding agents. A method was evolved which discriminates between bonding agents which have previously been regarded as equivalent. New facts such as importance of volume of the rubber rather than shape factor were uncovered. Significance of the work lies in better testing of metal-to-rubber bonding agents and better understanding of facts underlying design of rubber-metal spring units. (K11)

85-K. Gas Meter Part Production Improved Through Brazing. *Modern Machine Shop*, v. 23, Feb. 1951, p. 234, 236.

By a change from casting to brazed construction, Win Mfg. Co., East Haven, Conn., is now able to produce the part more quickly, efficiently, and economically. The part, which must be 100% gas-tight, consists of two stampings and a screw-machine part joined with a half ring of 1/16-in. brazing wire. (K8)

86-K. Brazing in Salt Baths Offers Production Economies. John B. Campbell. *Materials & Methods*, v. 33, Jan. 1951, p. 64-66.

The process and its advantages for joining both ferrous and nonferrous materials. (K8)

87-K. Welded Narrow Steel Sheets Used for Wide Stampings. Kenneth Rose. *Materials & Methods*, v. 33, Jan. 1951, p. 83-84.

Savings in metal costs which followed adoption of welded sheets for producing large automotive stampings. Seam, multiple-spot, flash, and mash welding are the four procedures used. (K3, CN)

88-K. Recent Developments in Fluxes for Welding. William M. Conn. *Journal of Metals*, v. 191, Feb. 1951, p. 98-99.

Most important properties of arc welding fluxes. The three principal groups of fluxes developed for submerged-arc welding are based on use of raw clay, glass, and mullite. Preparation and advantages of the ceramic or mullite flux developed by the author. (K1)

89-K. Is the Industry's Next Big Advance Ultrasonic Welding? Thomas A. Dickinson. *Welding Engineer*, v. 36, Feb. 1951, p. 17-19.

Some developments to date such as ultrasonic soldering of Al, and inspection. (K7, S13, Al)

90-K. How We Built a Jettisonable Fuel Tank. A. H. Petersen. *Welding Engineer*, v. 36, Feb. 1951, p. 20-23, 42.

Equipment and procedures developed for forming and welding a tank 34 in. diam. by 16½ ft. long. 61S Al is used, a specially rigged drawing press, and spot and automatic arc welding. (K1, K3, G4, Al)

91-K. Seattle's New Welded Stadium. Ray Bloomberg. *Welding Engineer*, v. 36, Feb. 1951, p. 24-25.

Use of arc welding saved about 200 tons of steel by eliminating gusset plates and rivets. It also cut construction time and resulted in a stronger structure. (K1, T26, CN)

92-K. Rings From Titanium. *Welding Engineer*, v. 36, Feb. 1951, p. 29.

How Ti rings for aircraft jet engines are successfully flash-butt welded. (K3, T24, Ti)

93-K. Iron Ore Unloader. W. B. MacLean. *Welding Engineer*, v. 36, Feb. 1951, p. 30-31, 42.

Combined welded and riveted construction of 15-ton unloader. (K general, T26, CN)

94-K. Design for Welded Connections. II. T. B. Jefferson and W. J. Brooking. *Welding Engineer*, v. 36, Feb. 1951, p. 32-34.

Designing to save weld metal, maintenance of close tolerances, material and space economy of welded fastenings, strength of weld metal, and effects of external stresses upon weld joints. (K general)

95-K. 50% Saving. *Welding Engineer*, v. 36, Feb. 1951, p. 35.

By buying the steel and welding it to make its own dipper sticks, Clemens Coal Co., Pittsburg, Kans., is able to realize savings of around 50% in the cost of a stick. Use of submerged-arc welding. (K1, CN)

96-K. How to Weld Gray Cast Iron. M. J. Kellner. *Welding Engineer*, v. 36, Feb. 1951, p. 36-37.

Repair procedures using both gas and arc welding. (K1, K2, CI)

97-K. Metal Sealing Techniques for Large Television Tubes. William L. Hyde. *Radio & Television News*, v. 45, Feb. 1951, p. 38-39.

Cone is made of a special Cr-Fe alloy steel. (K11, T1, AY)

98-K. A Report on Weldability and Mechanical Properties of Manganese-Vanadium Plate Steel. T. W. Merrill. *Industry & Welding*, v. 24, Feb. 1951, p. 24-27.

Report includes micrographs, macrographs, hardness-survey diagrams, and tables. (K9, Q general, AY)

99-K. Resistance Welding Eliminates 7 Operations on Lock Assembly. *Industry & Welding*, v. 24, Feb. 1951, p. 28, 82.

Procedures at Stamford, Conn., Div., Yale & Towne Mfg. Co. (K3)

100-K. All-Welded Steel Boats. Joseph Fortunato. *Industry & Welding*, v. 24, Feb. 1951, p. 30.

Construction of small Diesel-powered boats by Welin Davit & Boat Co., Perth Amboy, N. J. (K1, T22, CN)

101-K. Easy Way to Weld Zinc Parts. L. B. White. *Industry & Welding*, v. 24, Feb. 1951, p. 34-36.

Oxy-acetylene procedure which gives satisfactory results. (K2, Zn)

102-K. Control of Distortion in Manufacture of 30-Foot Beams. *Industry & Welding*, v. 24, Feb. 1951, p. 42-43.

Combined use of specially designed welding clamps and automatic submerged-arc welding equipment recently enabled Republic Welding and Flame Cutting Co., Cleveland, to weld over 1000 ft. of specially designed bridge beams speedily and with a minimum of distortion. (K1, T26, CN)

103-K. Laboratory Controls Efficiency in Welding Program. Joseph Scandling. *Industry & Welding*, v. 24, Feb. 1951, p. 49-50.

Outlines work of laboratory of Marion Power Shovel Co. (K9, CN)

104-K. Salvaging Castings by Welding of Defects. G. E. Bellew. *Canadian Metals*, v. 14, Jan. 1951, p. 23-26, 42.

Equipment, materials, electrodes, and techniques for arc welding of mild steel, low-alloy and stainless steel castings. (K1, ST)

105-K. Development of a Synthetic Resin Adhesive Suitable for Metal-to-Metal Bonding. E. E. Barton. *Plastics Institute, Transactions*, v. 18, Oct. 1950, p. 1-21.

Factors which affect the adhesion of metal surfaces when using synthetic-resins, particularly phenolic-type cements and hardened steel surfaces. This type of cement, unmodified, is not satisfactory. Improvements in performance are achieved by modifying with a thermoplastic or slow-curing resin, by incorporation of finely divided inert fillers such as silica or alumina, and by addition of a small quantity of a wetting agent. (K12)

106-K. Subassembly Riveting; Some Applications of the Automatic Type of Machine to Airframe Units. *Aircraft Production*, v. 13, Jan. 1951, p. 12-17.

Procedures. Includes preliminary punching and dimpling operations. (K13, G2)

107-K. Synthetic Resin Adhesives for Metal Bonding. C. J. Moss. *Plastics* (London), v. 16, Jan. 1951, p. 3-6.

Emphasizes use of "Araldite" and "Redux" processes and adhesives. 10 ref. (K12)

108-K. Solders and Soldering: Some Recent Advances. H. C. Watkins. *Metallurgia*, v. 42, Dec. 1950, p. 372-376.

A descriptive review. (K7)

109-K. The Welding of Aluminium and Its Alloys. E. Barron. *Machinery Lloyd* (Overseas Edition), v. 22, Dec. 23, 1950, p. 75, 77-78.

A review. (K1, K2, Al)

110-K. Transfer of Manganese, Silicon, Phosphorus, and Sulfur From the Flux Into the Weld Metal During Automatic and Semiautomatic Welding With Coated Electrodes, 2 Mm. in Diameter. (In Russian.) B. B. Iskoz, M. R. Shraerman, and E. F. Petrov. *Avtogennoe Delo* (Welding), v. 21, Oct. 1950, p. 10-13.

Investigation for steel containing 0.35% Mn, 0.98% Si, 0.018% P, and 0.033% S showed that the content of Mn, Si, P, and S in the weld metal depends on welding conditions, particularly specific consumption of flux. Transfer of each element was investigated individually. (K1, CN)

111-K. Primary Structure and Causes of Formation of Cracks During Welding of Cromansil Steel. (In Russian.) S. V. Avakyan and N. F. Lashko. *Avtogennoe Delo* (Welding), v. 21, Oct. 1950, p. 13-16.

Method of metallographic etching to reveal the structure of weld metal and causes of crack formation. Study of five zones of thermal influence of welding shows that intensity and time of heating during atomic-hydrogen welding are intermediate between those present during arc and gas welding. (K1, M21, AY)

112-K. One-Sided Automatic Welding of Low-Carbon Steel of up to 16 Mm. Thickness. (In Russian.) N. A. Fedorov, A. I. Kuzin, and T. Ya. Shandra. *Avtogennoe Delo* (Welding), v. 21, Oct. 1950, p. 17-20.

The welding longitudinal or ring seams (as in boilers) on one side of the part being welded, using a flux "pad" on the back of the seam, was investigated. Means of supporting the "pad" against the joint. Strength characteristics of such welds, compared with those welded on both sides, were satisfactory. (K1, CN)

113-K. Method of Joining Parts by "Electrorivets". (In Russian.) S. A. Egorov. *Avtogennoe Delo* (Welding), v. 21, Oct. 1950, p. 20-24.

Characteristics of this welding method as applied to steel sheets, based on the natural properties of a stationary arc discharge operating for a short time under a layer

of flux. Welding with and without rivet holes in tne upper sheet was studied. Optimum conditions were determined for different cases. (K13, CN)

114-K. Investigation of the Influence of Individual Defects on Mechanical Properties of "Electroriveted" Joints. (In Russian.) M. M. Kraichik and A. V. Obukhov. *Avtogennoe Delo* (Welding), v. 21, Oct. 1950, p. 24-26.

Influences of the most frequently encountered defects (hot tears and circumferential unwelded places) in "electroriveted" parts on strength characteristics under three forms of loading. Data from tests on single-rivet specimens of low-carbon steel in thicknesses of 2-4 mm. (K13, CN)

115-K. Better Welding at Lower Cost. Part II. Lew Gilbert. *Industry & Welding*, v. 24, Feb. 1951, p. 38, 40, 66-67.

Edge preparation, positioning, jigs and fixtures, etc. (To be continued.) (K1, K2, G22)

116-K. Butt Welding Wire and Rod Economically. H. J. Chamberlain. *Wire and Wire Products*, v. 26, Feb. 1951, p. 146-147.

How wire, rod, band, and tape stock can be quickly and economically butt welded in a wide variety of shapes and forms by use of Do-All equipment. (K3)

117-K. Welding Saves Steel in Three Tall Buildings. LaMotte Grover and Alfred E. Pearson. *Engineering News-Record*, v. 146, Feb. 8, 1951, p. 35-37.

All-welded construction of frames of three multi-story buildings recently completed in Birmingham, Ala. (K1, T26, CN)

118-K. The Tensile Forces in Tightened Bolts. A. H. Stang. *Product Engineering*, v. 22, Feb. 1951, p. 118-120.

Techniques and experimental work. Effects of various factors such as lubricant used and surface condition of threads. (K13)

119-K. Bonding Butyl Rubber to Brass. R. W. Kaercher and George W. Blum. *Industrial and Engineering Chemistry*, v. 43, Feb. 1951, p. 488-493.

A testing method for evaluation of comparative bonding strength. Influence of methods of surface preparation, pickling conditions, and surface contamination on the various brass compositions. Photomicrographs illustrate the various degrees of surface uniformity. Optimum conditions for time, temperature, and pressure of cure; effect of brass composition; and relative strength obtained from different methods of surface preparation. 66 ref. (K11, Cu)

120-K. Submerged-Melt Welding With Multiple Electrodes in Series. A. R. Lytle and E. L. Frost. *Welding Journal*, v. 30, Feb. 1951, p. 103-110.

See abstract of "Series-Arc Welding", *Welding Engineer*, item 37-K, 1951. (K1, L24, SS, Cu, Ni)

121-K. 1950 Adams Lecture: Dynamic Characteristics of D.-C. Welding Machines. Charles H. Jennings. *Welding Journal*, v. 30, Feb. 1951, p. 117-138.

Electrical characteristics of a welding machine, regardless of type of electrodes used, are a determining factor in results obtained. Dynamic characteristics are more important than the static volt-ampere curve. Current overshoot or surge was shown to have an important influence on ability of a d.c. welding machine to hold a short arc. Minimum dynamic characteristic, as determined by current droop, has an important influence on ability to maintain an arc at low electrode-current densities. Results of weld tests on mild-steel plates. (K1, CN)

122-K. Tubular Sections in Frame Design of Hydraulic Benders. E. J. DeWitt, F. J. Lammers, and F. D. Alexander. *Welding Journal*, v. 30, Feb. 1951, p. 139-143.

Welded construction of the equipment, which is composed of structural beams and pipes. (K general, T5, CN)

123-K. Crack Sensitivity of Aircraft Steels. J. Koziarski. *Welding Journal*, v. 30, Feb. 1951, p. 163-166.

Discusses paper by A. N. Steinberger, B. J. De Simone, and J. Stoop (Sept. 1950 issue; see item 565-K, 1950). A case which does not agree with other authors' findings. SAE 4130 Cr-Mo steel in 0.049-in. sheets was welded and tested. Three lots of only nominal differences in composition gave anomalous results. Two satisfied an Army-Navy specification, but had poor weldability characteristics; while the third did not satisfy the specification, but had satisfactory weldability. 10 ref. (K9, AY)

124-K. "Heliarc" Welding in Production. Robert Bowman. *Welding Journal*, v. 30, Feb. 1951, p. 167-168.

Discussion of paper by T. E. Piper (Sept. 1950 issue; see item 560-K, 1950). Investigation of the energy generated at the arc in helium and in argon and also the ease with which a stable arc could be established in the two gases. Results indicate that argon is more suitable than He for hand welding thin gages of stainless steel sheet. The arc in argon can be established at lower currents and also the arc drop is half of that in He for the same current. (K1, SS)

125-K. Food Cabinet Production Jumps 2600% Through Use of Resistance Welding. *Welding Journal*, v. 30, Feb. 1951, p. 171.

How cabinets and gas and electric ranges can be designed for fabrication by resistance welding to effect enormous production increases and consequent lowering of costs. (K3, CN)

126-K. Hints on How to Weld Sheet Lead. E. J. Chester. *Welding Journal*, v. 30, Feb. 1951, p. 173-174.

Instructions for torch welding. (K2, Pb)

127-K. Adjusting the Oxyacetylene Flame. R. G. Harner. *Welding Journal*, v. 30, Feb. 1951, p. 175-176.

Illustrated directions for various types of work. (K2, G22)

128-K. How to Bring Worn Parts Back to Life. E. A. Shevey. *Welding Journal*, v. 30, Feb. 1951, p. 180.

Braze-welded sprockets and gears. Practical hints on procedure. (K8, CN)

129-K. Salvage of Castings by Welding of Defects. G. E. Bellew. *Transactions of the American Foundrymen's Society*, v. 58, 1950, p. 669-674.

Previously abstracted from preprint. See item 294-K, 1950. (K1, E general, ST, SS, CI)

130-K. Fabrication in Britain; A Survey of Ten Years' Progress. *Welding & Metal Fabrication*, v. 19, Jan. 1951, p. 2-10.

Refers almost exclusively to welding developments. (K general)

131-K. New Tube Factory for Liverpool. *Welding & Metal Fabrication*, v. 19, Jan. 1951, p. 25-27.

Weld fabrication of factory building. (K1, T26, CN)

132-K. Welding Metals With Separate Melting Processes. V. P. Nikitin. *Welding & Metal Fabrication*, v. 19, Jan. 1951, p. 28-30. (Translated from *Doklady Akademii Nauk SSSR* (reports of the Academy of Sciences of the USSR), v. 56, No. 5, 1947, p. 477-480.)

New method which utilizes two independent heat sources for melting base and filler metals. A concentrated source of heat is used to heat and fuse to a predetermined depth the surface of the parent metal. At the same time a continuous or discontinuous stream of molten filler metal which has been melted in a separate melting device is fed into the molten-metal pool on the surface of the base metal. (K6)

133-K. A Survey of Modern Theory on Welding and Weldability. (Series continued) D. Seferian. *Sheet Metal Industries*, v. 28, Jan. 1951, p. 59-72, 76.

Confined to the principal engineering and structural steels including: Cr-Mo steels for aircraft construction; low-alloy, Cu-Cr steels used in bridges and structures; Ni-Cr-Mo self-hardening steels; and austenitic, 18-8 Ni-Cr stainless steels. (To be continued.) (K9, AY, SS)

134-K. Bonding of Rubber to Metal. C. J. Moss. *British Plastics*, v. 24, Jan. 1951, p. 22-26.

"Redux" process which does not require the preliminary brass-plating process. A phenolic resin and a polyvinyl formal powder are used to develop a strongly adhesive bond. The rubber surface must be treated with concentrated H_2SO_4 for a short time, and the metal surface must also be suitably prepared. Bond-strength data for different rubber-metal combinations. (K11)

135-K. Reclamation of Castings. *Foundry Trade Journal*, v. 90, Jan. 25, 1951, p. 95-100.

Discussion of Reports T.S.23 and T.S.26 of the Institute of British Foundrymen on gray iron and nonferrous castings respectively. Repair procedure in the foundry using burning, welding, brazing, soldering, annealing, impregnation, calking and plugging, and plating and metal spraying. (K general, E general)

136-K. (Pamphlet) **Safety in Electric and Gas Welding and Cutting Operations.** 44 pages, 1950. American Welding Society, 33 W. 39th St., New York 18, N. Y. 50c.

This "American Standard" is divided into eight sections as follows: scope of the standard, definition of terms, installation and operation of arc welding, installation and operation of gas welding and cutting, installation and operation of resistance welding, fire prevention and protection, protection of personnel, and ventilation and health protection. Bibliography. (K1, K2, K3, A7)

137-K. (Book) **Welded Deck Highway Bridges.** James G. Clark, editor. 247 pages. 1951. James F. Lincoln Arc Welding Foundation, 12818 Coit Rd., Cleveland. $2.00.

Ideas presented in connection with the 1949 contest sponsored by the Foundation covering the best way to make an all-welded, 120-ft. deck highway bridge. Structural types, floor systems, new sections, special connections and details, and quantity and costs. (K general, T26)

138-K. (Book) **Philips Practical Welding Course.** Ed. 2. 225 pages. Philips Electrical, Ltd. (Industrial Dept.), Century House, Shaftesbury Ave., London W. C. 2, England. 7s., 6d.

Essentials of arc welding. Every phase of arc welding from its fundamental principles and practical welding technique to weld examination and cost estimation. (K1)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

L

CLEANING, COATING AND FINISHING

73-L. Advances in Production Methods in Metal Finishing. Adolph Bregman. *Metal Progress,* v. 59, Jan. 1951, p. 76-81.

Reviews developments of past five years. (L general)

74-L. Wear Resistant Electroplate. *Metal Progress,* v. 59, Jan. 1951, p. 114, 116. (Condensed from "Electrodeposition of Alloys of Phosphorus and Cobalt or Nickel", Abner Brenner, Dwight E. Couch, and Eugenia Kellogg Williams.

Previously abstracted from *Journal of Research of the National Bureau of Standards* and from *Plating.* See items 98-L and 188-L, 1950. (L17, Co, Ni)

75-L. Automatic Plating Meets Stiff Defense Production Standards. John V. Davis. *Steel,* v. 128, Jan. 29, 1951, p. 63-66.

Equipment and procedures applicable to a wide variety of jobs. (L17)

76-L. Tapered Step-Down Shafts Brushed 20% Faster. *Steel,* v. 128, Jan. 29, 1951, p. 72.

Improved brushing equipment removes heat treat discoloration and surface imperfections from tapered alloy steel golf club shafts. (L10, AY)

77-L. Report on the Cleaning of Sheet Metal Prior to Vitreous Enamelling. *Sheet Metal Industries,* v. 28, Jan. 1951, p. 89-94.

Experimental work on electrolytic cleaning; emulsion spray cleaning; effect of additions of surface-active agents to the ground-coat slip; phosphate coating; relation between chemical constitution and aging; and grease burning for cleaning. Appendixes cover alkaline cleaning and degreasing before vitreous enameling; trichlorethylene degreasing; high-temperature grease burning and acid scaling of sheet iron; experiments with phosphate coating; and degreasing and enameling tests on standard cups. (L12, L13, L27, CN)

78-L. Lacquering Metals: Brushing; Spraying; Dipping; Barrelling. E. S. Tonks. *Metal Industry,* v. 77, Dec. 29, 1950, p. 319-321.

Pros and cons of these processes; also their respective applications. (L26)

79-L. "Bonderizing"; Equipment and Processes for Paint Adhesion. M. Reeves. *Metal Industry,* v. 78, Jan. 5, 1951, p. 7-8.

A method of pretreatment that provides a corrosion-inhibiting base for a subsequent high-class paint finish. It can be easily and quickly applied to iron, steel, galvanized iron or "galvanneal," cast iron, Zn-base die castings, Cd and Al. (L14)

80-L. From A Metallurgist's Notebook: Porous Die-Castings. *Metal Industry,* v. 78, Jan. 5, 1951, v. 78, Jan. 5, 1951, p. 9-10.

Conclusions drawn from an investigation of difficulties encountered in polishing Zn-base die castings. (L12, E13, Zn)

81-L. Plant Control to Reduce Enamelling Rejects. J. H. Gray. *Foundry Trade Journal,* v. 90, Jan. 4, 1951, p. 19-23. (L27, CN)

82-L. The Effect of Ultrasonics on Electrolytic Processes. I. Electrodeposition of Nickel in an Ultrasonic Field. (In German.) Albert Roll. *Zeitschrift für Metallkunde,* v. 41, Oct. 1950, p. 339-343.

An experimental arrangement for the generation and application of ultrasonic frequencies to electroplating. Qualitative experimental results and data in the form of graphs. (L17, Ni)

83-L. Chemical and Electrochemical Sharpening of Worn Files. (In German.) *Metalloberfläche,* sec. B, v. 2, Dec. 1950, p. 179-180.

Experimental evaluation of proposed methods shows that they can prolong the life of files from 20 to 50%, mostly because of the cleaning and roughening action of the acids or electrolytes, rather than because of their sharpening effect. (L12, L13, ST)

84-L. Polarographic Method for Determination of the Rate Constant of Electrolysis and Thickness of the Diffusion Layer During Electrodeposition of Metals. (In Russian.) P. N. Kovalenko. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Oct. 1950, p. 1067-1079.

Experimental investigation confirms the applicability of Fick's formula for calculation of the rate constant. Study of the influence of pH of the buffer solution on rate of electrodeposition of Cu shows that a high hydrogen index strongly inhibits electrolysis of Cu. Graphical method of determining rate of electrolysis. Applicability of the equations of Ilkovich, Nernst, and Bruner for determination of diffusion-layer thickness is proven. 11 ref. (L17)

85-L. Metallic and Nonmetallic Coatings for Gray Iron. (Concluded.) Charles O. Burgess. *Foundry,* v. 79, Feb. 1951, p. 108-111, 226-234.

Organic finishes, chemical conversion coatings, coloring, and cement lining and armor. 20 ref. (L general, CI)

86-L Finishing Military Aircraft. Part I. Metal Cleaning. Gilbert Close. *Industrial Finishing,* v. 27, Jan. 1951, p. 26-28, 31-32, 34, 36, 38, 40, 42.

Descriptive review of procedures. Covers steel, brass, bronze, Zn, Al, Mg, etc. (L12)

87-L. Whirling Flowcoater Used in Cleaning and Prime Coating Setup. Charles B. Levinson. *Industrial Finishing,* v. 27, Jan. 1951, p. 46-48, 50, 52.

Equipment used to finish various steel items for the building trades. (L12, CN)

88-L. New Blackening Bath for Ferrous Metals. A. F. Holden. *Materials & Methods,* v. 33, Jan. 1951, p. 128, 130.

New bath for use with stainless steels, cast iron, or most steels. Offered under the trade name Perma-Black, it is finding use in blackening of ferrous metals for either increased corrosion resistance or nonreflectivity. (L14, ST, SS, CI)

89-L. Abrasive Tumbling—A Precision Finishing Method. *Steel,* v. 128, Feb. 5, 1951, p. 81-84, 86, 89.

An illustrated review of recent developments in equipment, procedures, and applications. (L10)

90-L. Pot Life in Gas-Fired Galvanizing Settings. A. Higgs. *Industrial Gas,* v. 29, Jan. 1951, p. 10-11, 24-25. (Reprinted from *Institution of Gas Engineers,* Copyright Publication 370, "A Symposium of Short Papers", 1950, p. 25-29.)

Some British galvanizing practice together with tabulated performance data for several installations. (L16, Zn, ST)

91-L. Rails are Flame Cleaned and Sprayed With Rust Preventive to Thwart Salt-Air Corrosion on the Great Northern. *Railway Engineering and Maintenance,* v. 47, Feb. 1951, p. 127-129.

Equipment and procedures. (L14, R3, CN)

92-L. Plating Improved With Reverse Current Techniques. G. W. Slomin. *Iron Age,* v. 167, Feb. 8, 1951, p. 94-96.

Process which combines plating and electrolytic polishing in one operation. Current reversal reduces surface imperfections and holds edge build-up to a minimum. Brightness is also improved. Present and potential applications to a wide variety of metals. (L17, L13)

93-L. The Strength and Ductility of Electrodeposited Metals. III. Some Problems Relating to Specimen Preparation. Harold J. Read and Thomas A. Prater. *Plating,* v. 38, Feb. 1951, p. 142-144.

Variables encountered in specimen preparation are divided into two major classifications; those associated with the bath and directly related to it; and those which depend on other factors involved in plating and testing. Stresses variables of the second group. (L17, Q23)

94-L. Review of the Month: Plating From Copper Cyanide Baths. *Plating,* v. 38, Feb. 1951, p. 145-146.

Recommended bath compositions and procedures. (L17, Cu)

95-L. Cleaning and Preparation of Metals for Electroplating. I. Critical Review of the Literature. (Concluded). Henry B. Linford and Edward B. Saubestre. *Plating,* v. 38, Feb. 1951, p. 158-166.

Standards of cleanliness and methods of evaluating cleanliness. Final installment of Part I. Includes all references for Part I. 192 ref. (L17)

96-L. Electroforming—a Mass-Production Tool. *Steel,* v. 128, Feb. 12, 1951, p. 77-80.

The process and its varied applications. $100 million worth of products ranging from fountain pen caps to jet-engine motor mounts are produced annually. Plating solutions and properties for Ni, Cu, Fe, Co, and Ag. (L18, Ni, Cu, Fe, Co, Ag)

97-L. Western Spring Manufacturer Develops New Coating and Novel Dipping Process. Louis A. Berard. *Western Metals,* v. 9, Jan. 1951, p. 31-32.

New process for latex dip coating of bed and cushion springs. (L26, CN)

98-L. Electrodeposition of Germanium. Gustav Szekely. *Sylvania Technologist,* v. 4, Jan. 1951, p. 20.

Two plating baths and results obtained. (L17, Ge)

99-L. Glass as a Coating for Steel; Some Examples of the Functional Use of Glass-Coating Process. W. G. Martin. *Mechanical Engineering,* v. 73, Feb. 1951, p. 109-113. (L27, ST)

100-L. Ductility in Organic Bright Nickels; Effects of Contamination, Plating Conditions, & Cleaning Procedure. H. G. Patching. *Electroplating and Metal Finishing,* v. 4, Jan. 1951, p. 4-5, 12. (L17, Ni)

101-L. Coated Abrasives—Their History, Manufacture, and Application in Metal Finishing. A. E. Brown. *Electroplating and Metal Finishing,* v. 3, Dec. 1950, p. 606-608; v. 4, Jan. 1951, p. 6-8.

The various types of abrasives available and the methods of grading them, types of backing material in use, together with relative advantages and disadvantages, and influence of methods of coating on properties and utility. Second part covers the backing material, the adhesives, coating methods, and applications. (L10)

102-L. The Properties of Thick Sprayed Metal Coatings. J. Grilliat. *Electroplating and Metal Finishing,* v.

4, Jan. 1951, p. 13-15, 23. (Translated and condensed.

Previously abstracted from *Métaux et Industries*. See item 802-L, 1950. (L23, Q general, P general, M27)

103-L. Electroplating on Aluminum. *Electroplating and Metal Finishing*, v. 4, Jan. 1951, p. 16-18.

Notes on the nature of the problem and on a modified acid pickle for the anodizing pretreatment method. (L17, L19, Al)

104-L. Electrodeposition of Tin and Tin Alloys. J. W. Cuthbertson. *Electroplating and Metal Finishing*, v. 4, Jan. 1951, p. 26-27.

Summarizes two lectures. (L17, Sn, ST)

105-L. Plastics for Protective Coatings and Linings of Chemical Plant. E. E. Halls. *Metallurgia*, v. 42, Dec. 1950, p. 376-381.

The various types of plastics used; methods of application; and suitability for specific needs. (L26)

106-L. From a Metallurgist's Notebook: Enamelled Name Plates. H. H. Symonds. *Metal Industry*, v. 78, Jan. 19, 1951, p. 49-50.

Longitudinal lines which, at first glance, appeared to be score marks across the enameled surface of brass nameplates formed the subject of investigation. It was shown that the marks were not grooves but ridges produced as a result of a difference in the rate of attack on the base metal during the photo-etching process. (L26, Cu)

107-L. Colouring Copper and Copper Alloys. I. Chemical Methods—Sulphide Finishes. II. Chemical Methods —Oxide Finishes. C. Harris. *Metal Industry*, v. 78, Jan. 12, 1951, p. 23-25; Jan. 19, 1951, p. 43-44, 48.

Some of the many thousands of formulas available for coloring Cu and Cu alloys that give a consistent character. (L14, Cu)

108-L. Highly Unorthodox Innovations in the Enamel-Industry. (In German.) Hans. J. Karmaus. *Sprechsaal für Keramik; Glas; Email*, v. 83, Nov. 20, 1950, p. 453-456; Dec. 5, 1950, p. 473-476; Dec. 20, 1950, p. 493-497.

German patented innovations that cover the entire enameling process, including production, treatment, and pickling of the metal to be enameled; preparation and application of the enamels; enamel-melting furnaces, methods of preventing enameling defects; inspection methods; and enamel drying and milling equipment. (L27)

109-L. Concerning Structure of the Oxide Formed on an Aluminum Surface. (In Russian.) M. S. Beletskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Dec. 1, 1950, p. 551-553.

Assumption of Trillat, Brandenburger, and others, that the oxide surface layer of Al consists of γ-Al_2O_3 and bemite, is challenged. Results of investigation showed that bemite ($Al_2O_3 \cdot H_2O$) does not form during the oxidation of Al, but is the product of a secondary reaction taking place between water and dispersed Al_2O_3 present on the surface. Method of investigation. (L19, R2, Al)

110-L. Electrolytes for Electropolishing and Etching. (In Swedish.) E. Knuth-Winterfeldt. *Jernkontorets Annaler*, v. 134, No. 10, 1950, p. 538-539.

Electrolytes proposed by various authors were comparatively investigated. Results and applicability to various metals. (L13)

111-L. On the Electrolytic Polishing of Copper Alloys. (In English.) Tosihiko Okamura and Takasi Kimura. *Science Reports of the Research Institutes, Tohoku University*, ser. A, v. 1, Dec. 1949, p. 467-472.

Conditions and mechanisms of electropolishing of various alloys of the Cu-Zn, Cu-Al and Cu-Al-Zn system were investigated by obtaining Jacquet's characteristic curves. These were also measured for effects of additional elements on the alloys. (L13, Cu)

112-L. Protective Coating by Means of Chromium Diffusion. (In Spanish.) Walter Tofaute and W. Kock. *Instituto del Hierro y del Acero*, v. 3, July-Sept. 1950, p. 187-194.

Method as applied to steel, and its mechanism. The process of diffusion of Cr into the steel and structure of the intermediate layer are emphasized. (L15, ST, Cr)

113-L. Scale Removal Technique With the Stainless Steels. *Steel Processing*, v. 36, Dec. 1950, p. 623-628; v. 37, Jan. 1951, p. 28-30.

Mechanical and chemical methods and equipment. Eleven pickling-solution recipes and their applicabilities. Part II: details of experimental work on a $Fe_2(SO_4)_3$-HF bath, and method for its control analysis. (L10, L12, SS)

114-L. Aluminum Cylinders Without Cast Iron Liners. P. M. Heldt. *Automotive Industries*, v. 104, Feb. 15, 1951, p. 32-33, 98, 100, 104. (Condensed from article by Ernst Mahle in a recent issue of *Motortechnische Zeitschrift*.)

Recent developments in Germany which demonstrate feasibility of Cr plating Al cylinder bores. (L17, Cr, Al)

115-L. Continuous Electroplating Effects Operational Economy. Dan Reebel. *Steel*, v. 128, Feb. 19, 1951, p. 64-66.

Millions of small stamped fastening devices, pre-assembled screws and nuts, and twisted-tooth lockwashers are Zn and Cd plated annually at Shakeproof's new Elgin, Ill., plant. (L17, T7, Zn, Cd)

116-L. Surface Active Agents and Pickling Brittleness. Carl A. Zapffe and M. Eleanor Haslem. *Wire and Wire Products*, v. 26, Feb. 1951, p. 127-133.

Continues a series of researches on embrittlement of steel caused by absorption of hydrogen during acid pickling. Effects of bath additions other than pickling inhibitors—specifically the so-called surface active agents—also a foaming compound. Measurements of bendability using a specially designed wire bend test were used to follow quantitatively the changes produced by each reagent, alone and in combination with inhibitors in a standard 10% H_2SO_4 bath. (L12, Q23, ST)

117-L. Improve Product Appearance With Electrolytic and Chemical Finishes. *Product Engineering*, v. 22, Feb. 1951, p. 141-148.

Special section covers classes and types; how base metal affects selection; appearance and protective finishes; new developments and industry trends. Colored photographs of products. Folded chart shows properties, limitations, specifications, surface preparation, and uses of all types of organic, inorganic, and specialty finishes for metals. (L general)

118-L. Some Characteristics of Composite Tungsten Carbide Weld Deposits. Howard S. Avery. *Welding Journal*, v. 30, Feb. 1951, p. 144-161; disc., p. 161-162.

The characteristics of weld deposits from rods made by enclosing tungsten carbide granules in a mild-steel tube are shown to provide high abrasion resistance for hard facing use. The matrix has characteristics that range from those of tungsten steel to those of cast iron containing a considerable amount of secondary W-Fe carbides. Abrasion resistance depends largely on volume of undissolved carbides, and is generally better for gas welds. Vickers microhardness and microstructures. (L24, Q9, C-n, W, SG-j)

119-L. Self-Regulating High Speed Chromium Plating. J. E. Stareck, F. Passal, and H. Mahlstedt. *Proceedings, American Electroplaters' Society*, v. 37, 1950, p. 31-47; disc., p. 48-49.

A new process which includes the following characteristics: self-regulation, high current efficiency, high plating speed, wide plating range, activating effect, smooth deposits, and leveling action. (L17, Cr)

120-L. The Nodule Method of Measuring the Adhesion of Electrodeposited Coatings. Abner Brenner and Virginia Dare Morgan. *Proceedings, American Electroplaters' Society*, v. 37, 1950, p. 51-65; disc., p. 66-67.

Nodule method requires a skilled technician and is time consuming (10 specimens per day), but requires no specially shaped test pieces and no machining operations or expensive physical testing machines. Results are expressible in terms of ordinary mechanical units. (L17)

121-L. Advances in Electrodeposition in the Graphic Arts. Edward I. Peters. *Proceedings, American Electroplaters' Society*, v. 37, 1950, p. 69-84, disc. p. 84.

Rotogravure plate making, bimetallic lithographic plates, electrotyping, and miscellaneous applications of electrodeposition. Includes flow charts. 33 ref. (L17, T9)

122-L. High-Speed Nickel Plating of Curved Stereotypes. Kenneth L. Koessler and Robert R. Sloan. *Proceedings, American Electroplaters' Society*, v. 37, 1950, p. 85-89; disc., p. 89-90.

A nickel fluoborate solution produces the desired structure of the deposit with ease of solution control, extremely high deposition rates, stability toward pH changes, and economy of operation. Test procedure and results. (L17, Ni)

123-L. Electroplating and Metal Finishing Developments in Germany: 1940-1950. Richard Springer. *Proceedings, American Electroplaters' Society*, v. 37, 1950, p. 91-102; disc., p. 103.

Previously abstracted from *Metalloberfläche*. See item 612-L, 1950. (L17, L general)

124-L. Smoothing by Electropolishing and Chemical Polishing. Charles L. Faust. *Proceedings, American Electroplaters' Society*, v. 37, 1950, p. 137-150; disc., p. 150.

Reduction of friction, and structure and adhesion of electrodeposits. (L12, L13)

125-L. Leveling With PR Current Plating. George W. Jernstedt. *Proceedings, American Electroplaters' Society*, v. 37, 1950, p. 151-167; disc., p. 167-170.

Mechanical, chemical, and electrochemical methods of obtaining leveling. Factors affecting leveling with periodic-reverse current plating which include PR cycle, current density, thickness of deposit, agitation, solution composition, addition agent, and contamination. Applications of leveling. (L17)

126-L. Some Observations of the Microthrowing Power of Plating Solutions. C. E. Reinhard. *Proceedings, American Electroplaters' Society*, v. 37, 1950, p. 171-183; disc., p. 183.

An investigation of the controlling factors. An understanding of the mechanism by which microthrowing power functions was not obtained. It is believed that reactions taking place in a cathode film and the electrical characteristics of a porous cathode surface need to be more clearly understood. (L17)

127-L. Leveling in Cobalt-Nickel Plating Solutions. Louis Weisberg. *Proceedings, American Electroplaters' Society*, v. 37, 1950, p. 185-191, disc., p. 191.

Leveling in a particular type of Ni-plating solution which is distinguished by the presence of some added Co. Purification and operating conditions and physical characteristics and corrosion resistance of deposits. (L17, Ni)

128-L. Surface Contour and Leveling. A. H. DuRose, W. P. Karash, and K. S. Willson. *Proceedings, American Electroplaters' Society,* v. 37, 1950, p. 193-212; disc., p. 212-213.

Reviews the literature on leveling by plating, polishing, and buffing. Need for information on deposit distribution in and adjacent to small scratches. Suggests several methods of approach to the problem. Need for a more fundamental understanding of reactions at the cathode under various conditions. 24 ref. (L17, L10)

129-L. General Discussion of Leveling. *Proceedings, American Electroplaters' Society,* v. 37, 1950, p. 215-222.

Refers to surface finishing by various methods for the specific purpose of making the surfaces as level as possible. (L general)

130-L. Metal Finishing by Abrasive Tumbling. Hubert M. Goldman. *Proceedings, American Electroplaters' Society,* v. 37, 1950, p. 223-242; disc., p. 242-243.

A general discussion of the phases and factors involved. (L10)

131-L. Abrasive Belt Polishing. E. E. Oathout. *Proceedings, American Electroplaters' Society,* v. 37, 1950, p. 245-249; disc., p. 249-250.

New mechanical equipment and improvements developed since the war. (L10)

132-L. Reduction in Plating Cost by Use of Flat-Polished and Phosphate-Coated Steel. H. J. McVey and V. M. Darsey. *Proceedings, American Electroplaters' Society,* v. 37, 1950, p. 251-254; disc., p. 254-255.

Automatic polishing of steel in the flat followed by phosphate coating and lubrication to protect the polished surface during the forming operation. (L10, L14, ST)

133-L. Water Base Buffing Liquid. Ellsworth T. Candee and S. Lewis Doughty. *Proceedings, American Electroplaters' Society,* v. 37, 1950, p. 257-266; disc., p. 266.

Aqueous emulsions with a solid internal phase which retain advantages of standard buffing-bar compounds and eliminate restrictions due to mechanical considerations. They also eliminate fire hazard and tendency of the abrasive to settle. Applications. (L10)

134-L. Why Pay for Porosity Research? *Proceedings, American Electroplaters' Society,* v. 37, 1950, p. 277-278.

Discussion of article by W. A. Wesley previously abstracted from *Plating.* See item 598-L, 1950. (L17)

135-L. The Use of Radioactive Isotopes for the Determination of Current and Metal Distribution in Electrodeposition. John Kronsbein. *Proceedings, American Electroplaters' Society,* v. 37, 1950, p. 279-285; disc., p. 286-288.

A new method for determining current and metal distribution in the electrodeposition of Cu from an acid-sulfate solution. Also indicates a new method for accurate measurement of extremely thin electrodeposits. Includes plots of radiation distribution for different shapes. (L17, S19, Cu)

136-L. Selection and Application of Cleaning Room Equipment. Stanley Krzeszewski. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 450-455.

Previously abstracted from *American Foundryman.* See item 296-L, 1950. (L10, L12, E general)

137-L. Surface Treatment and Finishing of Light Metals. Part 5. (Series continued.) S. Wernick and R. Pinner. *Sheet Metal Industries,* v. 28, Jan. 1951, p. 79-87.

The anodizing process for Al: theory; types of anodizing processes; application of anodizing; protective applications; decorative applications; adhesion of organic finishes; composition of the coating; dielectric or barrier layer; porosity; mechanism of film growth; and secondary reactions. 33 ref. (To be continued.) (L19, Al)

138-L. Etch Pre-Treatment Primers. E. E. Halls. *Machinery* (London), v. 78, Jan. 18, 1951, p. 114-116.

Various types for use on a variety of metal surfaces prior to painting, which, in addition to providing protection against corrosion, also have the effect of etching the metal surface so that adhesion of both primer and paint is considerably improved. Qualitative performance of various metals and alloys, pretreated in different ways before application of enamel-type paints. (L26)

139-L. Colouring Miscellaneous Metals: Silver—Tin—Gold—Zinc—Cadmium—Nickel. C. Harris. *Metal Industry,* v. 78, Jan. 26, 1951, p. 71-73.

The more important commercial methods.
(L14, Ag, Sn, Au, Zn, Cd, Ni)

140-L. Some Preliminary Treatments for Tungsten Wires Used in Electron Tubes. (In French.) Mesnard and Uzan. *Vide,* v. 5, Nov. 1950, p. 896-904.

Methods for cleaning tungsten wires, an important factor in the quality of electron tubes. Removal is of graphite by mechanical and chemical methods. Several anomalies observed during measurement of temperature of a tungsten wire in a vacuum. Photomicrographs show wire structures under various conditions. (L10, L12, T1, W)

141-L. Procedure for Cathodic Atomization of Metal. (In French.) M. E. H. Bacquet. *Vide,* v. 5, Nov. 1950, p. 916-917.

Apparatus and procedure. Qualitative results obtainable with different metals. A table gives rates of atomization for series of pure metals in dry air, nitrogen, hydrogen, or oxygen. Atomized metal is removed from the vicinity by vacuum and deposited where desired. (L25)

142-L. Role of Ion Hydration in Electropolishing Baths. (In French.) Eugene Darmois, Israel Epelboin, and Djafar Amine. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 231, Nov. 27, 1950, p. 1222-1223.

The role of water supplied by solutions containing anhydride ions was studied. Results show that the effect is proportional to the quantity of free H_2O, which depends directly on the degree of cation hydration. This property may be used in determination of the degree of hydration of ions. (L13)

143-L. (Book) **Modern Development in Metal Finishing.** Arrow Press, Ltd., 29 Grove Rd., Leighton Buzzard, Beds., England. 5s.

Edited version of eight lectures (several previously abstracted). The contents include: "Developments in Electrodeposition Processes and in Plant for Electrodeposition," E. A. Ollard; "Phosphate Treatments for Iron and Steel," H. A. Holden; "The Protection and Decoration of Aluminium," V. F. Henley; and "Methods for the Protection of Magnesium Alloys," W. F. Higgin. Three lectures dealing with history and general principles, composition and application methods, and industrial applications of vitreous enamel are included by W. E. Benton, S. Hallsworth, and H. Laithwaite, respectively. (L general)

144-L. (Book) **Galvanizing (Hot-Dip).** Ed. 3. Heinz Bablik. (Clive A. Bentley, translator). 502 pages. 1950. E. & F. Spon, Ltd., 15 Bedford St., Strand, London W.C.2, England. 70s.

The sections on electrogalvanizing, sherardizing and spraying, included in the 1936 edition, have been omitted but the book has nevertheless been increased slightly in size. The treatment follows, in general, that of the earlier editions. Theoretical and experimental aspects receive far more attention than the practical side of the subject.
(L16, CN, Zn)

145-L. (Book) **Chromium Plating.** E. S. Richards. Ed. 3. 154 pages. 1950. Charles Griffin & Co., Ltd., 42 Drury Lane, London W.C.2, England. 17s.

Deals not only with the actual operation of chromium plating but also with auxiliary processes, pretreatments and related topics such as the plating shop and its equipment; stripping; polishing; cleaning; Cu and Ni plating; finishing Cr plate; and protection of workers.
(L17, Cr)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

25-M. X-Ray Diffraction Methods as Applied to Powders and Metals. William L. Davidson. "Physical Methods in Chemical Analysis" Vol. I. Academic Press Inc., New York, 1950, p. 17-105.

Techniques, elements of crystal structure, formulas for interplanar spacing, and use of techniques for chemical analysis, crystal system identification, crystallite and particle-size determination, study of precipitation hardening and constitution diagrams, stress measurement, etc. 121 ref. (M22, S11)

26-M. Electron Diffraction. L. O. Brockway. "Physical Methods in Chemical Analysis", Vol. I, Academic Press Inc., New York, 1950, p. 167-191.

Interpretation of patterns. Technique and applications. 57 ref.
(M22, S11)

27-M. Electron Microscopy. Robert D. Heidenreich. "Physical Methods in Chemical Analysis", Vol. I, Academic Press Inc., New York, 1950, p. 535-586.

Imaging, types of instruments, magnification calibration, stereoscopy, and application to colloidal systems and solid surfaces. 63 ref.
(M21, S11)

28-M. Gallium Anisotropy and Crystal Structure. R. W. Powell. *Nature,* v. 166, Dec. 30, 1950, p. 1110-1111.

Relationship of electrical conductivity to lattice orientation.
(M26, P15, Ga)

29-M. An Experimental and Thermodynamic Investigation of the Hydrogen-Titanium System. A. D. McQuillan. *Proceedings of the Royal Society,* ser. A, v. 204, Dec. 22, 1950, p. 309-323.

Temperature - pressure - concentration relationships of the system were studied, and its more important thermodynamic aspects considered. Part of the equilibrium diagram was established, and free-energy curves for the α- and β-solutions are plotted for a number of temperatures. Results were used to obtain values for the latent heat of the $\alpha \rightleftarrows \beta$ transformation and the transformation temperature.
(M24, N6, P12, Ti)

30-M. A New Mechanically Recording Dilatometer for Physical-Thermal Analysis of Materials and for Measurement of Their Expansion, Plus Apparatus for the Study of Isothermal Annealing. (In French.) Pierre Chevenard. *Revue de Métallurgie,* v. 47, Nov. 1950, p. 805-816.

Complete details, including a number of schematic diagrams. Technique of use and results of a typical determination. (M23, P11)

31-M. New Phases of the MnP (B31) Type. (In German.) *Zeitschrift für Metallkunde,* v. 41, Oct. 1950, p. 358-367.

Preparation of the following alloy compositions: AuGa, PdSi, PtSi, NiGe, PdGe, IrGe, PtGe, RhSb, MnSb, IrPb, and RhBi. Their powder patterns indicate that they possess definite phases corresponding to these compositions. 26 ref. (M26, EG-a)

32-M. A Contribution to Knowledge Concerning the Temperature Hysteresis of Several Properties of α Copper Solid Solutions. (In German.) Konrad Schubert and Rudolf Jaggi. *Zeitschrift für Metallkunde,* v. 41, Oct. 1950, p. 367-369.

Precise determinations on a commercial Cu-Mn-Al alloy (83% Cu, 12.1% Mn, 3.5% Al) show that the lattice constants of the α-phase are dependent on its previous treatment. These constants are related to dilatometric measurements and to changes in electrical resistance. (M26, M23, P15, Cu)

33-M. Crystallographic Indices of Cut Grain Areas in Polished Metals. (In German.) Hans Kostron. *Zeitschrift für Metallkunde,* v. 41, Oct. 1950, p. 370-377.

Methods for establishing orientation of the grains of a metallographic sample and for calculating angle of the cut plane to the crystal axes. With the aid of eight graphs, which comprise all possible positions of the polished plane, one can determine any index, provided at least three angles are definitely known. Diagrams, photomicrographs, tables, and graphs illustrate results obtained by other investigators for Al-Cu-Mg alloys. 14 ref. (M27, M26)

34-M. Diffusion Scattering of X-Rays by Plastically Deformed Aluminum Single Crystals. (In Russian.) E. V. Kolontsova. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Nov. 11, 1950, p. 189-192.

Studied for slightly and highly deformed Al single crystals. Method of study, including special apparatus which permits investigation at temperatures as low as 82-83° K. Results indicate that a photographic method for recording the diffusion scattering is sensitive enough for study of the initial stages of plastic deformation of single crystals. (M23, Q24, Al)

35-M. Crystal Structure of the Ternary System CuMgSn. (In Russian.) P. I. Kripyakevich, E. I. Gladyshevskii, and E. E. Cherkashin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Nov. 11, 1950, p. 205-207.

Investigated for compositions of 33.3% Sn, 7-40% Cu, and 33-60% Mg. (M26, M24, Cu, Mg, Sn)

36-M. Formation and Behavior of Subboundaries in Silicon Iron Crystals. C. G. Dunn and F. W. Daniels. *Journal of Metals,* v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 147-154.

Single crystals of Si iron were plastically deformed by either cold rolling or bending and subsequently annealed. Results of micrographic and X-ray investigation are presented and discussed. Includes Laue patterns and photomicrographs. 16 ref. (M26, Q24, Fe)

37-M. Examination of Metals Under Polarized Light. I. Theory and Apparatus. B. W. Mott and H. R. Haines. *Research,* v. 4, Jan. 1951, p. 24-33.

A review. 70 ref. (M21)

38-M. The Structure of Hardmetals. Paul Schwarzkopf. *Powder Metallurgy Bulletin,* v. 5, Dec. 1950, p. 68-79.

Need for intensification of research in the field of cemented carbides and other hard metals, (substances having structural characteristics similar to the refractory carbides). This is especially imperative because of lack of W and Co in the U. S. Both development of high-temperature materials on a hardmetal basis as well as development of W-free (and preferably also Co-free) tool materials, appears to require a better understanding of the structure of hard metals. Crystal structure, size factor, and Hagg's rule. Lattice-dimension data for a large number of carbide and nitride interstitial phases. 28 ref. (M26, C-n, SG-h,j)

39-M. Electron Microscopy. F. A. Hamm. *Analytical Chemistry,* v. 23, Jan. 1951, p. 17-20.

A review. 61 ref. (M21)

40-M. The Solubility Relationships in the Aluminium-Sodium and Aluminium-Silicon-Sodium Systems. C. E. Ransley and H. Neufeld. *Journal of the Institute of Metals,* v. 78, Sept. 1950, p. 25-46.

Solid solubility of Na in Al was determined by direct measurement of the amount dissolved when high-purity Al is immersed in liquid Na. The data allow calculation of the rate of diffusion of Na in solid Al. The liquid-miscibility boundary in the binary system was also redetermined. When Al containing Si in solid solution is heated in liquid Na, a ternary compound is formed as a surface layer or sub-scale. By means of experiments it was possible to derive approximate values for concentration of Si and Na in solid solution in equilibrium with this compound at various temperatures. A tentative diagram for the Al-Si-Na system is presented. 11 ref. (M24, N1, Al)

41-M. The Surface Condition of Polished Aluminium With a Note on the Effect of Surface Scratches. E. A. Owen and Y. H. Liu. *Journal of the Institute of Metals,* v. 78, Sept. 1950, p. 93-104.

The effect of polishing the surface of pure Al with different materials, including wash leather, emery paper, Al, Cu, and Zn was investigated by X-ray diffraction. In all cases the surface assumes the metastable state, in which lattice parameter is greater than it is in fully annealed material, so that crystallites in the polished layer are in a state of strain. The stresses remain until removed by suitable heat treatment. The amount of room-temperature recrystallization that occur after polishing varies with the different polishing materials, and effectiveness as polishers changes with nature of the material. Effect of a single surface scratch on Al was found to extend at least 1 mm. from the scratch. (M26, L10, Al)

42-M. Structure of Thin Films of Aliphatic Esters and Alcohols on Metals. J. V. Sanders and D. Tabor. *Proceedings of the Royal Society,* ser. A, v. 240, Jan. 9, 1951, p. 525-533.

An electron-diffraction study of structure and orientation of the above thin films. Effect of temperature was examined by transmission and reflection methods. Bearing of the results on nature of the disorientation process, compared with boundary-lubricating properties of the substances. 18 ref. (M26, R2)

43-M. Orientation of Fatty Acid and Soap Films on Metal Surfaces. J. W. Menter and D. Tabor. *Proceedings of the Royal Society,* ser. A, v. 204, Jan. 9, 1951, p. 514-524.

An electron-diffraction study of structure and orientation. Effect of temperature on orientation, using the reflection method and an improved experimental technique. On non-reactive metals such as Pt, the disorientation temperature is close to the bulk melting-point of the fatty acid. On reactive metals such as Zn and Cd, disorientation occurs at a higher temperature, close to the bulk melting point of the corresponding metallic soap. Observations are compared with the lubricating properties of fatty acids and soaps on metal surfaces. 32 ref. (M26, R2)

44-M. The Further Development of Metallographic Methods for Measurement of Grain Sizes. (In German.) Cord Petersen. *Metall,* v. 5, Jan. 1951, p. 8-13.

Presently known method and a proposed method of determining grain-size distribution on the basis of physically or mathematically established standards. Graphs, diagrams, and photomicrographs. 20 ref. (M27)

45-M. On the Nature of Preston-Guinier Atom-Groups in an Age-Hardened Aluminium-Copper Alloy. Part I. Experimental. Part II. Theoretical. (In English.) Taira Suzuki. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Oct. 1949, p. 183-192.

Results of work done an Al alloy containing 4.31% Cu, 0.29% Si, and 0.14% Fe. (M25, Cu)

46-M. New Sigma-Phases in Binary Alloys of the Transition Elements of the First Long Period. W. B. Pearson, J. W. Christian, and W. Hume-Rothery. *Nature,* v. 167, Jan. 20, 1951, p. 110.

Recent work which has led to discovery of four new σ-phases: Cr-Mn, V-Mn, V-Co, and V-Ni. Structural features are described. 10 ref. (M26, Cr, Ni, Mn, Co, V)

47-M. Intermetallic Compounds in Ternary Aluminium-Rich Alloys Containing Transitional Metals. J. N. Pratt and G. V. Raynor. *Proceedings of the Royal Society,* ser. A, v. 205, Jan. 22, 1951, 103-118.

Consideration of the Brillouin zone structures of Co_2Al_9, Co_2Al_5, and $NiAl_3$ suggests that the numbers of electrons accepted per atom are greater than the band theory would indicate, and are more nearly equal to the vacancies in the "atomic orbitals" postulated in the Pauling theory of transitional metals. Further information with regard to alloying characteristics of transitional metals was obtained by investigating ternary alloys of Al and Si with Cr, Mn, Fe, Co and Ni. 14 ref. (M25, M26, Al)

48-M. Local Distribution of Inclusions in Steel; Repercussions Arising From Confidence in Results of Their Enumeration. (In French.) A. Palazzi. *Revue de Métallurgie,* v. 47, Dec. 1950, p. 907-929.

Investigation indicates that the total number of inclusions in a specimen follows Poisson's law. Deviations from the Poisson distribution are the result of accidents. Develops an inclusion index valid for each steel melt. Very high indexes are associated with low values of mechanical properties. 12 ref. (M28, Q general, ST)

49-M. Solid Solutions of Nickel. (In Russian.) I. I. Kornilov. *Izvestiya Akademii Nauk* (Bulletin of the Academy

of Sciences of the USSR), Section of Chemical Sciences, Nov.-Dec. 1950, p. 582-589.

Classifies types and number of possible ternary and quaternary solid solutions of nickel. Formation of complex saturated and unsaturated solid solutions of nickel with elements of the 4th periodic group was investigated. (M27, Ni, Ni)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

35-N. Aging of Aluminium Alloys; Recent Russian Work. *Chemical Age,* v. 64, Jan. 6, 1951, p. 25-28.

Reviews recent work of Buinov and Lerinman. Work of other investigators in Russia and elsewhere. 12 ref. (N7, Al)

36-N. Process of Nucleation in Solid Solutions. (In French.) Pierre Laurent. *Revue de Métallurgie,* v. 47, Nov. 1950, p. 835-842.

A theoretical analysis on the basis of the literature. 20 ref. (N2)

37-N. An Immediate Cause of Flake Formation. (In French.) J. G. Platon. *Revue de Métallurgie,* v. 47, Nov. 1950, p. 857-862; disc., p. 862.

Experimental investigations seem to indicate that the influence of hydrogen is not the main cause and that several other factors are involved in the formation of flakes in steel. (N12, ST)

38-N. The Decomposition Structure of Magnesium-Rich Magnesium-Aluminum Solid Solutions. (In German.) *Zeitschrift für Metallkunde,* v. 41, Oct. 1950, p. 332-334.

Experimental studies were made to determine why supersaturated Mg-Al solid solutions sometimes decompose into "eutectoids" and sometimes into "oriented segregates". Heat treating experiments were made with specimens of 4, 7, and 12% Al, non-homogenized and homogenized 1, 2, 4, 8, and 14 days at 420° C. (N7, Mg)

39-N. Age Hardening. L. F. Mondolfo. *Journal of Metals,* v. 191, Feb. 1951, p. 95.

Research in progress on several nonferrous alloy systems. Investigation by hardness and electrolytic potential measurements. Results indicate that there are at least two types of age hardening, depending on complexity of the transformation required to form the lattice of the precipitate from the lattice of the solid solution. (N7, EG-a)

40-N. Diffusion Phenomena Occurring During Sintering. Ben H. Alexander. *Journal of Metals,* v. 191, Feb. 1951, p. 95.

Research in progress. The systems being studied are: Ag-Cu, Cu-Ni, Ag-Au, Cu-Fe, Cu-Zn, Ag-Ni, Cu-W, Ag-Zn, and Au-Ni. They were chosen to give a wide range of mutual solubilities and consequently greatly differing amounts of diffusion upon sintering of copper compacts. (N1, H15, Cu)

41-N. "Oriented Growth" in Primary Recrystallization. Joseph J. Becker. *Journal of Metals,* v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 115.

Certain points to be considered before the oriented-growth hypothesis is applied to primary recrystallization, with necessary complete divorce of the mechanism of recrystallization from details of the deformation process. (N5)

42-N. Cobalt Self-Diffusion: A Study of the Method of Decrease in Surface Activity. R. C. Ruder and C. E. Birchenall. *Journal of Metals,* v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951 p. 142-146.

Method was used to determine rates of diffusion of Co into Co and Ni. Effects of geometry and surface preparation. Equations for the two self-diffusion coefficients. (N1, Co, Ni)

43-N. Interface and Marker Movements in Diffusion in Solid Solutions of Metals. Luiz C. Correa da Silva and Robert F. Mehl. *Journal of Metals,* v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, p. 155-173.

An experimental study of the movement of markers in the systems Cu/α brass, Cu/Snα-solid solution, Cu/Alα-solid solution, Cu/Ni, Cu/Au, and Ag/Au, employing many types of markers and a variety of temperatures. Marker movement was confirmed. Association with the manner in which atoms move during diffusion. 19 ref. (N1, Cu, Ag, Au)

44-N. Effect of Ternary Additions on the Age-Hardening of a Copper-Silver Alloy. Harold Margolin and Walter R. Hibbard, Jr. *Journal of Metals,* v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 174-180.

Effect of ten ternary additions on aging of a Cu+5% Ag alloy was measured by X-ray and microstructural examination, and hardness testing. A supersaturated Cu-rich transition structure was found. Effect of the ternary element was related to differences between transition and precipitate lattice parameters. Analogies with solution and strain hardening. 22 ref. (N7, Cu)

45-N. On the Recrystallization and Grain Growth in Tungsten Wire. H. A. DeVincentis and J. H. Dedrick. *Sylvania Technologist,* v. 4, Jan. 1951, p. 6-8.

Important factors affecting the above with emphasis on manufacturing problems in the electron-tube and lamp industries. Several methods of controlling these phenomena. (N5, N3, T1, W)

46-N. The Effect of Small Quantities of Cd, In, Sn, Sb, Tl, Pb, or Bi on the Aging Characteristics of Cast and Heat-Treated Aluminium-4% Copper-0.15% Titanium Alloy. H. K. Hardy. *Journal of the Institute of Metals,* v. 78, Oct. 1950, p. 169-194.

Results of extensive experimental work and theoretical analysis. 15 ref. (N7, Al)

47-N. The Allotropy of Manganese. J. W. Christian. *Journal of the Institute of Metals,* v. 78, Oct. 1950, on p. 195-202.

Free energy vs. temperature relations are calculated for the α, β and γ forms, of Mn, using existing thermodynamic data. In the case of the α and γ forms, relative free-energy curves can be drawn over the whole temperature range from 0° to 1400° K., the free energies being expressed in terms of heat content of the α phase at absolute zero. For the β phase, a free-energy curve can be constructed for the range 300-1400° K. in terms of heat content at room temperature. 10 ref. (N6, P12, Mn)

48-N. Some Observations on the α-β Transformation in Titanium. A. D. McQuillan. *Journal of the Institute of Metals,* v. 78, Nov. 1950, p. 249-257.

The transformation was studied in Ti prepared both by the van Arkel iodide process and by Mg reduction. A new method, involving observations on the changes of hydrogen equilibrium pressure with temperature in very dilute solutions of hydrogen in the metal, was used. It was found that whereas the transformation in the van Arkel material occurs sharply at a single temperature, that in the Mg-reduced material takes place gradually over a range of some 100° C. Resistance measurements illustrate the same point. An explanation is suggested for the negative temperature coefficient of resistivity of β-Ti recently described by Greiner and Ellis. (N6, Ti)

49-N. The Transformations $\alpha \rightarrow \gamma$ and $\gamma \rightarrow \alpha$ in Iron-Rich Binary Iron-Nickel Alloys. N. P. Allen and C. C. Earley. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 281-288.

See abstract under similar title from *Iron and Steel,* item 17-N, 1951. (N8, Fe, Ni)

50-N. A Note on Silicon Distribution Between Austenite and Liquid Metal in Freezing Hypo-Eutectic Cast Iron. A. Hultgren and Olof Carlsson. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 303-304.

Silicon distribution, as shown in the Fe-Si-C equilibrium diagram of Jass, was qualitatively confirmed. Sampling was carried out using a graphite tube, and the assumption is made that no graphite eutectic is formed. (N8, M24, CI)

51-N. New Type of Graphitization of Cast Iron Cooled Through the Eutectoid Range. (In English.) Keizo Iwase and Isao Aoki. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Oct. 1949, p. 139-142.

Analogy of the structure of gray cast iron and abnormal steel. Formation of free ferrite instead of the graphite eutectoid. Application of the new theory to production of blackheart malleable cast iron. (N8, CI)

52-N. On the Extention of the Nearest Neighbour Assumption in the Theory of the Superlattice and the Intermetallic Compound. (In English.) Hiroshi Sato. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Dec. 1949, p. 405-410.

The assumption is formally extended to include dependence of interaction potential energy upon degree of order and to make clear the nature and limit of this treatment. The treatment explains many characteristics of the superlattice which are not explained by the ordinary theory. The results obtained also describe well the characteristics of intermetallic compounds. Concludes that the transition from ordinary superlattice to intermetallic compound is continuous from the energy point of view. (N10)

53-N. Absorption of Nitrogen by Molten Iron Alloys. I. Study on Pure Iron. II. Study on Fe-Ni, Fe-Cr and Fe-Mn Alloys. (In English.) Tunezo Saito. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Dec. 1949, p. 411-424.

Experiments were performed between 1530 and 1750° C. Results obtained were fairly well interpreted by statistical thermodynamics based on the assumption that the structure of molten iron is quasicrystalline and that absorbed gas atoms are situated at the vacant spaces in the iron lattice. The entire range of the alloys was studied. 12 ref. (N12, Fe, Ni, Cr, Mn)

54-N. On Surface Figures of Molten Cast Iron. (In English.) Ichiro Iitaka and Kisao Abe. *Reports of the Casting Research Laboratory,* Jan. 1950, p. 1-3.

On solidification of molten cast iron, the surface in contact with the atmosphere becomes covered with an oxide film. Some cracks are formed during cooling of this film,

which produces various figures. Effects of melting methods, mold materials, and shapes. Classifies the patterns observed into different types. (N12, E25, CI)

55-N. The Effects of Alloying Elements in Steel. I. Joseph K. Stone, Jr. *Industrial Heating,* v. 18, Jan. 1951, p. 50-52, 54, 56.

Fundamental principles of microstructural change in heat treatment of steel. Isothermal transformation diagrams are used to show that all such changes result from the transformation of austenite. (To be continued.) (N8, ST)

56-N. Effect of Aluminum Content on Internal Quality of a Killed Steel. V. E. Elliott and N. D. Fragasse. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 131-137; disc., p. 137-138.

Abnormal etch pattern observed in large blooms of AISI C-1070 steel. Porosity was found to be associated with grain-boundary sulfide inclusions; and the tendency for this type of inclusion to form was found to be associated with an Al addition of 1.2 lb per ton for grain-size control. A slight decrease in the amount of Al added was found to greatly lessen the occurrence and severity of the pattern developed.
(N23, D2, ST)

57-N. An Introduction to the Annealing of Nodular Iron. J. E. Rehder. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 298-309; disc., p. 309-311.

Previously abstracted from preprint. See item 115-N, 1950.
(N8, Q general, CI)

58-N. Subcritical Isothermal Graphitization. H. A. Schwartz, J. D. Hedberg and R. Eriksen. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 578-583; disc., p. 583.

Previously abstracted from preprint. See item 114-N, 1950. (N8, CI)

59-N. Formation of Order in the Alloy $CdMg_3$. H. Steeple and H. Lipson. *Nature,* v. 167, Jan. 20, 1951, p. 110-111.

Formation of a superlattice in $AuCu_3$ was found to be accompanied by interesting X-ray diffraction effects. Similar effects have now been found for $CdMg_3$. (N10, Cd, Mg)

P

PHYSICAL PROPERTIES AND TEST METHODS

30-P. The Rehbinder Effect. E. N. da C. Andrade, R. F. Y. Randall, and M. J. Makin. *Proceedings of the Physical Society,* v. 63, sec. B, Dec. 1, 1950, p. 990-995.

According to Rehbinder, the immersion of wires of certain metals in a non-polar paraffin containing a little oleic acid increases the rate of flow of the metal under a given stress and its electrical resistivity. Experiments show that the mechanical effect can be obtained with single crystals of Cd if the surface is contaminated by a thin oxide layer, which is known to increase the critical shear stress, but not if the surface is clean. The effect is accordingly attributed to disruption of the hardening surface layer by the active agent and not to penetration into the metal, as assumed by Rehbinder. It was not possible to detect any electrical effects with Cd or Pb crystal wires having either clean or contaminated surfaces.
(P15, Q2, Cd, Pb)

31-P. Physical Properties of Some Liquid Metals. R. R. Miller, compiler. *Metal Progress,* v. 59, Jan. 1951, p. 80B. (From "Liquid Metals Handbook", Office of Naval Research Publication NAVEXOS P-733.)

A table. Covers Al, Sb, Bi, Cd, Cs, Ga, In, Pb, Li, Mg, Hg, K, Rb, Na, Tl, Sn, Zn, two Na-K alloys, and the eutectic Pb-Bi alloy.
(P general, EG-a)

32-P. A New Method for the Measurement of Hall Coefficients. B. R. Russell and C. Wahlig. *Review of Scientific Instruments,* v. 21, Dec. 1950, p. 1028-1029.

Circuit diagrams for apparatus for rapid measurement of Hall coefficients and for continuous recording of Hall voltages. (P15, SG-n, p)

33-P. Electrical Resistance of Platinum at High Temperatures. H. E. Bennett. *Review of Scientific Instruments,* v. 21, Dec. 1950, p. 1029.

Schneider and Hollies reported (v. 21, 1950, p. 94) that resistance of a coil of Pt wire, of "commercial" or "thermocouple" purity, wound on a grooved alundum rod and supported in the center of a furnace, reached a maximum at about 1575° C. and progressively decreased as the temperature was further increased up to about 1650° C. The present author checked this observation and found no such inflection in the resistance-temperature curve. Suggests that Schneider and Hollies' results were due to changes in electrical resistivity of the alundum rod.
(P15, S16, Pt)

34-P. Superconductivity of Tin Isotopes. I. W. D. Allen, R. H. Dawton, J. M. Lock, A. B. Pippard, and D. Shoenberg. **II.** W. D. Allen, R. H. Dawton, Marianne Bar, K. Mendelssohn, and J. L. Olsen. *Nature,* v. 166, Dec. 23, 1950, p. 1071-1072.

Results of measurements of superconducting transition temperatures and critical fields of nearly pure tin isotopes separated by the electromagnetic method. Results of measurements on the same isotopes by two different methods, in addition to some experiments on magnetic susceptibility. Detailed measurements of dependence of electrical resistance on temperature and magnetic field were made. (P15, Sn)

35-P. Hall Effect in a Selenium Single Crystal. K. W. Plessner. *Nature,* v. 166, Dec. 23, 1950, p. 1073.

Results of measurement are charted and discussed. (P15, Se)

36-P. The Evaporation of Titanium. L. G. Carpenter and W. N. Mair. *Proceedings of the Physical Society,* v. 64, sec. B, Jan. 1, 1951, p. 57-66.

Data on the evaporation rate of β-Ti over the range 1650-1810° K. and an equation which represents the data. Latent heat of vaporization is deduced both from measured values of evaporation rate, together with known thermodynamic functions of the solid and gas, and also from temperature coefficient of evaporation rate. Variation of total radiation with temperature, and of vapor pressure at the melting point is estimated. 13 ref. (P12, Ti)

37-P. Ferromagnetic Materials and Ferrites; Properties and Applications. M. J. O. Strutt. *Wireless Engineer,* v. 27, Dec. 1950, p. 277-284.

Losses in ferromagnetic materials; optimum conditions for cored inductances; physics of ferromagnetism, composition of useful ferrites, and applications of ferrites.
(P16, SG-n, p)

38-P. Surface Energy and Structure of Crystal Boundaries in Metals. K. T. Aust and B. Chalmers. *Proceedings of the Royal Society,* ser. A, v. 204, Dec. 22, 1950, p. 359-366.

Variation of boundary energy γ_B in Pb with difference of orientation θ was determined using methods previously described for Sn. Straight-line plots of log θ against γ_B/θ were obtained for Pb and Sn. These results are closely consistent with Shockley and Read's theoretical predictions based on a dislocation model of the transition boundary. (P10, M26, Pb, Sn)

39-P. Calculation of the Curie Points of Ferromagnetic and Paramagnetic Substances Based on the Concept of Intermittent Activation. (In French.) Robert Forrer. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 231, Nov. 20, 1950, p. 1130-1131.

Basis of a theory concerning the existence of intermittent activation, and a method for determination of Curie points based on intermittent-activation values. (P16)

40-P. Progress of the Physics of Solids. Frederick Seitz. *Journal of the Franklin Institute,* v. 251, Jan. 1951, p. 156-166.

Emphasis on development of the theory of nearly perfect crystals.
(P general, M26, U1)

41-P. Segregation in Regular Ternary Solutions. Part I. J. L. Meijering. *Philips Research Reports,* v. 5, Oct. 1950, p. 333-356.

Segregation in ternary phases is examined from a thermodynamic point of view. 10 ref. (P12, M24)

42-P. Oxide Cathode Base Metal Studies. Ralph Forman and Glenn F. Rouse. *Journal of Research of the National Bureau of Standards,* v. 46, Jan. 1951, p. 30-37.

A method for comparing the properties of two oxide catnodes, one with a high-purity Ni base and the other with a Ni base containing a small percentage of Mg. Data showing effect of Mg on the rate of electrolytic activation and life of the cathode. Influence of cathode and anode on pulsed current decay at high current densities. 15 ref.
(P15, T1, Ni)

43-P. Thermoelectromotive Force of a Superconductor Versus the Same Metal in the Non-Superconductive State. M. C. Steele. *Physical Review,* ser. 2, v. 81, Jan. 15, 1951, p. 262-267.

Measurements of thermo-electromotive force of superconducting vs. normal junctions were made for Pb, Sn, In, and Tl. The technique used differed in several respects from that employed by previous workers. Results are discussed in light of existing theory. The data obtained are in good agreement with a relation derived from Fermi-Dirac statistics and the assumption that the Thomson coefficient of a superconductor is zero. 14 ref.
(P16, Pb, Sn, In, Tl)

44-P. Vanadium-Oxygen Equilibrium in Liquid Iron. John Chipman and Minu N. Dastur. *Journal of Metals,* v. 191, Feb. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 111-115.

Equilibrium data on the reaction of H_2O vapor with V dissolved in liquid Fe at 1600° C. Thermodynamic behavior of V and O_2 when present together in the melt. A deoxidation diagram shows concentrations and activities of V and O_2 in equilibrium with V_2O_3, or FeV_2O_4. 18 ref.
(P12, Fe, V)

45-P. Vapor Pressure of Inorganic Substances. IV. Tantalum Between 2624 and 2943° K. James W. Edwards, Herrick L. Johnston, and Paul E. Blackburn. **V. Zirconium Between 1949 and 2054° K.** Gordon B. Skinner, James W. Edwards, and Herrick L. Johnston. *Journal of the American*

Chemical Society, v. 73, Jan. 1951, p. 172-176.

Experimental data are tabulated and charted. 17 ref. (P12, Ta, Zr)

46-P. A Thermodynamic Study of Liquid Metallic Solutions. III. The Systems Bismuth-Gold and Thallium-Gold. O. J. Kleppa. *Journal of the American Chemical Society,* v. 73, Jan. 1951, p. 385-390.

Investigated by the electromotive-force method. Both systems show large entropies of mixing believed to originate in the large differences in atomic size between the two components. (P12, Bi, Au, Tl)

47-P. The Effects of Plastic Deformation on Magnetic Properties of Polycrystalline Metals. Ursula M. Martius. *Canadian Journal of Physics,* v. 29, Jan. 1951, p. 21-31.

The concept of a "closed flux shell" as a fundamental quality of polycrystalline metal. Consequences of this model and experimental evidence supporting it. An explanation of the effect of plastic deformation on magnetic properties is suggested by considering changes in the size of the closed flux shell which will occur during plastic deformation. (P16, Q24, SG-n,p)

48-P. A Method of Measuring Gamma-Ray Absorption Coefficients at 0.51 Mev. P. E. Argyle, G. M. Griffiths, and J. B. Warren. *Canadian Journal of Physics,* v. 29, Jan. 1951, p. 83-85.

The coincidence method makes use of the angular correlation between pairs of annihilation quanta to eliminate the effect of scattered radiation usually present in absorption measurements. Mass absorption coefficients were determined for Pb, Cu, and Al. (P10, Pb, Cu, Al)

49-P. Discussion on the Paper: "Change of Electrical Resistance During Strain-Ageing of Iron", by A. H. Cottrell and A. T. Churchman. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 322-324.

Covers above paper published in July 1949 issue (see item 3B-229, 1949). Includes author's reply. (P15, N7, Fe)

50-P. Thermal Dilation of Copper. (In English.) D. S. Eppelsheimer and R. R. Penman. *Physica,* v. 16, Oct. 1950, p. 792-794.

The prediction that certain cubic metals may not be precisely cubic at temperatures below their melting points led to the present investigation. Pure Cu was examined for anisotropy in its thermal dilation. Temperatures of examination ranged between 18 and 770° C. Plotting lattice constant vs. temperature, the thermal dilation of pure Cu was found to be isotropic throughout the range investigated. (P11, Cu)

51-P. Measuring Pressure by Means of Metallic Probes. (In German.) E. Fischer. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 93, Jan. 11, 1951, p. 37-40.

How probes can be used to measure long-time, short-time, or impact pressures up to 10,000 and more atmospheres. Metals with certain properties (which are enumerated) are unsatisfactory for this purpose. Graphs show pressure vs. expansion curves of various metals such as Pb, Cu, Al, and Ni alloys, etc. (P11, Pb, Cu, Al, Ni)

52-P. Permanent Magnets. (In French.) C. Vuilleumier. *Von Roll Mitteilungen,* v. 9, Dec. 1950, p. 65-96.

Part I reviews the fundamental principles of magnetism. Parts II and III: rules for magnet design and calculations, showing how to substitute the new highly magnetic alloys for the older types. Part IV: the metallurgy of permanent-magnet alloys, including effect of crystal structure on magnetic properties. Final part: manufacture of permanent magnets in a Swiss plant. 11 ref. (P16, SG-p)

53-P. Investigation of Magnetic Properties of Alloys of Manganese With Nickel and Cobalt. (In Russian.) F. Gal'perin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Dec. 1, 1950, p. 515-518.

Influence of concentration of the components on the magnetic properties of these alloys. Method of preparation of test samples. (P16, Mn, Ni, Co)

54-P. Energy of Mixing of Binary Metallic Systems. (In Russian.) Ya. E. Geguzin and B. Ya. Pines. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Dec. 1, 1950, p. 535-538.

Determination of energies on the basis of measurements of heat of fusion and heat capacity of five binary systems: Pb-Sn, Bi-Cd, Bi-Sb, Bi-Sn, and Pb-Bi. Technique of measurement. A formula for calculation of the values is proposed and theoretically analyzed. 10 ref. (P12, Pb, Sn, Bi, Cd, Sb)

56-P. Hall Effect in Indium. (In Russian.) E. S. Borovik. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Dec. 11, 1950, p. 639-641.

Dependence of resistance on temperature and magnetic field strength, and of Hall constant on the latter, at 2.17, 4.22, 14.2, and 78° K. Experimental data closely correspond to those theoretically computed by Sondheimer, Wilson, and Kohler. (P15, In)

57-P. Concerning the Goldhammer Effect in Ferromagnetic Substances. (In Russian.) S. V. Vonsovskii and K. P. Rodionov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Dec. 11, 1950, p. 643-646.

Theory of the Goldhammer effect discovered in 1889 and clarified on the basis of thermodynamic theory by Akulov in 1939. Attempts to clarify the nature of the forces responsible for this effect. 10 ref. (P16, SG-n,p)

58-P. Investigation of Magnetic Properties of Alloys With Ordered Structure. (In Russian.) F. Galperin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Dec. 11, 1950, p. 647-650.

Five ferromagnetic alloys having an ordered structure were investigated. They were Ni_3Mn, Ni_3Fe, FeCo, MnBi, and CrTe. A specially developed method of investigation, including a new calculation formula. 11 ref. (P16, SG-n,p)

59-P. Certain Laws of Magnetic Viscosity. (In Russian.) R. V. Telesin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Dec. 11, 1950, p. 659-660.

On the basis of theoretical considerations corroborated by experimental data, the following laws governing magnetic viscosity are proposed: time of relaxation characterizing magnetic viscosity is directly proportional to differential susceptibility and inversely proportional to absolute temperature; magnetic viscosity does not depend on changes in magnetic field, but only on final state of the ferromagnetic. (P16, SG-n,p)

60-P. Influence of Silicon on Thermodynamic Behavior of Carbon Dissolved in Solid and Molten Iron. (In Russian.) A. M. Samarin and L. A. Shvartsman. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Nov. 1950, p. 1696-1700.

Experimental investigation showed that the influence of Si on the activity of C dissolved in γ-iron may be approximately described on the basis of the assumption that both a C atom and a Si atom cannot be found simultaneously in an elementary nucleus. In liquid iron-carbosilicon alloys, saturated with C at 1300° C., the total amount of C and Si is practically constant and approximates 0.2 atomic %. (P12, ST)

61-P. The Release of Energy Associated With Crystal Restoration Process in Cold Worked Polycrystalline Copper. (In English.) Taira Suzuki. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Oct. 1949, p. 193-201.

Experimental results. (P10, N5, Cu)

62-P. Reduction Equilibria of Iron Oxides. I. Measurement of the Equilibrium of Reaction, Fe_3O_4 (in Wuestit) $+CO=3FeO$ (In Wuestit) $+CO_2$. (In English.) Koji Sanbongi. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Oct. 1949, p. 213-222.

Experimental method, apparatus and results. (P12, Fe)

63-P. The Change of the Electric Resistance of Bismuth Crystals in Strong Magnetic Fields. Part I. The Method and Apparatus for Observing the Change of Resistance of Bismuth in Strong Magnetic Fields. Part II. Experimental Results. The Change of Resistance of Bismuth Crystals in a Magnetic Field With the Current Perpendicular to the Field. (In English.) Tasaku Tanabe. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Oct. 1949, p. 267-282.

18 references. (P15, Bi)

64-P. On the Magnetostriction of Iron-Aluminium Alloys and a New Alloy "Alfer". (In English.) Kotaro Honda, Hakaru Masumoto, Yuki Shirakawa, and Takeo Kobayashi. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Dec. 1949, p. 341-347.

Magnetostriction of Fe-Al alloys was measured by an apparatus designed by the authors in various longitudinal fields of less than 1200 oersteds. The positive magnetostriction of iron gradually increases on addition of Al, while the negative one decreases. In the range of Al content 11.5-13.2%, magnetostriction is very high. These alloys are designated "Alfers." (P16, SG-n,p, Fe)

65-P. Electric Resistance, Hall Effect, Magneto-Resistance and Seebeck Effect on a Pure Tellurium Film. (In English.) Tadao Fukuroi, Seiichi Tanuma, and Shotaro Tobisawa. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Dec. 1949, p. 365-372.

Investigated from −195 to +60° C. Electrical resistance and weight of the deposits were compared for various thicknesses of the films and a correlation found between them. Apparatus and data. (P15, P16, Te)

66-P. On the Electro-Magnetic Properties of Single Crystals of Tellurium. I. Electric Resistance, Hall Effect, Magneto-Resistance, and Thermo-Electric Power. (In English.) Tadao Fukuroi, Seiichi Tanuma, and Shotaro Tobisawa. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Dec. 1949, p. 373-386.

Investigated from −190 to +300° C. The crystals were found to be P-type extrinsic semiconductors at low temperatures, while intrinsic conduction supersedes it above the ice point. In terms of the electrical and electromagnetic data, concentrations, mobilities, effective masses, and mean free paths of positive holes and electrons are expressed

as functions of temperature. 21 ref. (P15, P16, Te)

67-P. The Physics of Sheet Steel. (Series continued). G. C. Richer. *Sheet Metal Industries,* v. 28, Jan. 1951, p. 19-22.

Development and use of the basic equations of technical magnetization. (To be continued.) (P16, ST)

68-P. Magnetic Properties of Malleable Cast Iron. (In French.) Francois Danis. *Fonderie,* Nov. 1950, p. 2267.

Variation of magnetic properties with C, Si, and Mn content. (P16, CI)

69-P. (Pamphlet) **Pipe and Tubes for Elevated Temperature Service.** Bulletin 26, 1950, 64 pages. National Tube Co., Pittsburgh.

Data on the properties of steels employed for elevated temperatures and high pressures. Covers 26 different analyses representing a wide variety of chemical compositions. (P general, Q general, ST, SG-h)

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

46-Q. Operational Stresses in Automotive Gears. Earle Buckingham. *SAE Quarterly Transactions,* v. 5, Jan. 1951, p. 43-55, disc., p. 55.

Previously abstracted from condensed version in *SAE Journal.* See item 749-Q, 1950. (Q25, ST)

47-Q. Measurement of Surface Wear. H. Meincke. *Engineers' Digest,* v. 11, Dec. 1950, p. 417-419. (Translated and condensed.)

Previously abstracted under similar title from *Metalloberfläche.* See item 813-Q, 1950. (Q9)

48-Q. Nomenclature Used for Designating Properties of Materials. R. Alden Webster. *Welding Journal,* v. 30, Jan. 1951, p. 25.

So-called mechanical and physical properties are discussed in an attempt to clarify and to arrive at definitive statements. The distinction between the two groups of properties is quite different than that used in classifying abstracts for *Metals Review.* (Q general, P general)

49-Q. The Work of the Plasticity Committee of the Welding Research Council. *Welding Journal,* v. 30, Jan. 1951, p. 39s-41s.

Activities of the past year have consisted mainly in developing plans for possible research. (Q23)

50-Q. Relative Strain-Aging Tendency of Weld and Base Metal. R. W. Fountain and R. D. Stout. *Welding Journal,* v. 30, Jan. 1951, p. 43s-46s.

An investigation of the relative tendency of the weld-metal heat-affected zone and base metal to change ductility after straining and aging. Semikilled steel plate with 0.18% + C, ¾ in. thick, was used throughout the investigation. (Q23, J27, CN)

51-Q. A Notch-Bend Test. Carl A. Zapffe and Clee O. Worden. *Welding Journal,* v. 30, Jan. 1951, p. 47s-54s.

Development of a notched-bar bend test and its applicability to mild, chromium, and stainless steel. (Q5, CN, AY, SS)

52-Q. Evaluating Carbon Plate Steels by the Keyhole Charpy Impact Test. R. W. Vanderbeck. *Welding Journal,* v. 30, Jan. 1951, p. 59s-64s.

Application of keyhole-Charpy behavior to interpretation of impact results for a number of carbon steels shows how transition temperature is affected by composition, deoxidation practice, and plate thickness. (Q6, CN)

53-Q. Residual Stresses in Machined Surfaces. E. K. Henriksen. *Transactions of the American Society of Mechanical Engineers,* v. 73, Jan. 1951, p. 69-76.

The stress-inducing effect of single-point tools on steels with varying carbon content was studied. Methods for computing the stresses induced were developed. Highly concentrated stresses (up to 100,000 psi.) are produced. In ductile materials, such as carbon steel, the stresses are, generally, tensile; in cast iron they are compressive. Methods of investigation, and data for stresses produced in various materials, by various tools, and under various cutting conditions. Possible detrimental effects of these stresses. 18 ref. (Q25, G17)

54-Q. Safety Margins and Stress Levels in High-Temperature Equipment. Ernest L. Robinson. *Transactions of the American Society of Mechanical Engineers,* v. 73, Jan. 1951, p. 89-95, disc., p. 95-99.

Factors of safety and working-stress levels currently in use in high-temperature equipment, and their relationship to physical properties at high temperature, as determined by the various tests currently in use. Differences between various industrial applications are pointed out in comparison with rules at present used by General Electric Co. 21 ref. (Q25, SG-h)

55-Q. The Nature of Friction; The Phenomena of Wear and Boundary Lubrication. H. Brian Locke. *Metal Industry,* v. 77, Dec. 22, 1950, p. 303-305; Dec. 29, 1950, p. 323-324.

A general discussion, including the fact that, under normal conditions, a "dirt" film soon forms on all surfaces, including those of bearings, and acts as a boundary lubricant. 25 ref. (Q9)

56-Q. Long or Short Test-Pieces? H. Jungbluth. *Foundry Trade Journal,* v. 89, Dec. 28, 1950, p. 559-562. Translated from *Stahl und Eisen.*

Previously abstracted from original. See item 756-Q, 1950. (Q27, CI)

57-Q. Comparison of Mechanical Properties of Rolled Steel With and Without Annealing. (In French.) R. Edelbloude. *Revue de Métallurgie,* v. 47, Nov. 1950, p. 842-855; disc., p. 855.

Investigation performed on 11 different types of steels: low-carbon, medium-carbon, low-alloy, Cr-Ni, Ni-Cr-Mo, and Cr steels. Comprehensive data are tabulated. (Q general, J23, ST)

58-Q. Discussion of Paper by H. de Leiris, "Bursting of Containers Under Pressure." (In French.) *Revue de Métallurgie,* v. 47, Nov. 1950, p. 863-868.

Extensive separate discussions of above paper (Jan. 1950 issue; see item 240-Q, 1950.) by Portevin, Hérenguel, and Crussard. Includes three photomicrographs showing failure and deformation structures of an Al-Zn alloy. (Q23)

59-Q. Hardness and Wear. (In German.) Wilhelm Spath. *Metalloberfläche,* sec. A, v. 4, Dec. 1950, p. 177-180.

Experimental results on the relationship of hardness of wear resistant surfaces (ferrous) and of tensile strength to wear resistance. 11 ref. (Q9, Q29, ST)

60-Q. Opinions on the Study of Materials and Experiences with Machinery, Structures, and Buildings in Switzerland. (In Dutch.) M. Ros. *Metalen,* v. 5, Dec. 1950, p. 74-107.

Testing of structural parts for static and fatigue stresses as well as for stability, especially as applied to the above. Includes numerous diagrams, graphs, photoelastic stress patterns, micrographs, macrographs. 21 ref. (Q23, Q7, Q24)

61-Q. Research on the Strength Properties of Metals at Low Temperatures. (In German.) Karl Wellinger and Willi Seufert. *Zeitschrift für Metallkunde,* v. 41, Oct. 1950, p. 317-321.

Pressure vs. deformation curves obtained at room temperature and at −180° C. for a variety of metals. Results help to explain the brittleness of ferrous metals and of Mg and the toughness of certain nonferrous metals at low temperatures. Effects of low-temperature compression on hardness. 26 ref. (Q23)

62-Q. Strength Properties of Metals at Low Temperatures. (In German.) Albert Kochendorfer. *Zeitschrift für Metallkunde,* v. 41, Oct. 1950, p. 322-325.

Shows that computed temperature effects on yield point agree almost perfectly with Wellinger and Seufert's experimentally determined results. Explains the effects of temperature on different metals as well as the observation that the cubic face-centered metals have a "memory" for preliminary deformations at low temperatures, while the cubic body-centered metals do not have this "memory". (Q23, Q24)

63-Q. Influencing Factors in Determining Fatigue Strength From the Static Yield Point. (In German.) Alfred Schaal. *Zeitschrift für Metallkunde,* v. 41, Oct. 1950, p. 334-339.

Comparison of experimentally established fatigue strengths and yield points of 18 different carbon and alloy steels indicates a positive correlation between these properties. Surface deformation caused by normal machining has an insignificant effect on fatigue strength, but the latter is greatly reduced when average grain size is less than 10^{-4} cm. and when the metal has previously been severely deformed plastically over its entire cross-section. Foreign inclusions and brittle alloying elements may have a similar effect. 14 ref. (Q7, CN, AY)

64-Q. Production of Zones of High Wear Resistance on Pieces of Material. (In German.) Hermann Meincke. *Zeitschrift für Metallkunde,* v. 41, Oct. 1950, p. 344-346.

Preliminary experiments with mono and polycrystals were made to determine the crystal face of greatest scratch hardness and, hence, of greatest wear resistance. Conclusions were tested on a cast Al-Cu alloy (4% Cu) and a Cr-Ni steel. (Q9, Q29, Al, AY)

65-Q. The Fatigue Strength of Porous Sand-Cast Gamma-Silumin Parts. (In German.) Hans Reininger. *Zeitschrift für Metallkunde,* v. 41, Oct. 1950, p. 348-357.

Reviews the literature on the fatigue strength of γ-phase silumin and shows that a moderate amount of porosity does not necessarily reduce the fatigue strength of the alloy enough to warrant its rejection. The effects, classifications, and quantitative determination of porosity and its effect on fatigue strength. 16 ref. (Q7, Al)

66-Q. Relationship Between Criteria for the Second Stage of Relaxation and Creep of Austenitic Steel. (In Russian.) I. A. Oding. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Nov. 11, 1950, p. 197-200.

Derives a formula for this relationship on the basis of R. W. Bailey's hypothesis (1926) that creep consists of a process in which strength increases and decreases alternately. Comparison of data obtained by use of this formula on four different types of austenitic

steels (Cr-Ni-Co steels with additions of Mo, W, and Ti) with those of experimental investigation showed good agreement. (Q3, AY, SS)

67-Q. Effect of Columbium Additions on the Creep Strength of Heat Resistant Chromium-Nickel Steel. (In Russian.) A. M. Borzdyka. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Nov. 11, 1950, p. 213-214.

Experimentally investigated for six types of 14-14 Cr-Ni steel with W contents of 2.1-2.4%. Two of the steels were low-carbon (0.12-0.13% C). Analysis of tabulated data indicates that addition of 0.7-1.2% Cb increases creep strength of the low-carbon steel 1.5-2.0 times. It appears that creep strength of such steels depends largely on Cb:C ratio, the optimum ratio being about 10. (Q3, SS)

68-Q. Interpretation of Tension Creep-Time Relations. Joseph Marin and L. W. Hu. *ASTM Bulletin,* Jan. 1951, p. 57-59.

Proposes a creep-stress relation for creep of metals at elevated temperatures which is simple to use and at the same time gives a good fit to the test data. (Q3)

69-Q. An Evaluation of the Effective Gage-Length Equivalent of the Fillet and Shoulder of the Gage Length Portion of a Tension Test Bar Under Creep and Stress-Rupture Conditions. H. V. Kinsey. *ASTM Bulletin,* Jan. 1951, p. 60-62.

Errors introduced into creep measurements when the over-all test specimen is included in the extensometer system. Three high-temperature alloys were used as examples. Shows that it is not possible to arrive at a common correction factor for equivalent gage length, even for one alloy, if true effective gage length is to be determined within limits of $\pm 1\%$, unless a specimen having an 8-in. gage length is employed. (Q3, Q4)

70-Q. Friction. Frederic Palmer. *Scientific American,* v. 184, Feb. 1951, p. 54-58.

Fundamental causes of friction and the different theories which have been advanced, but not entirely reconciled. (Q9)

71-Q. Checks Hardness on-the-Job. *Iron Age,* v. 167, Feb. 1, 1951, p. 116.

Readings of metal hardness may now be taken any place in a plant or warehouse in a matter of seconds. It is done with a 30-oz., palm-sized hardness tester, made by Snow, Deakin and Co., Ltd., England. The device has been used to measure the hardness of flat, curved, round, and other shapes. Sheet metal as thin as 0.020 in. has also been successfully tested. (Q29)

72-Q. A Structural-Efficiency Evaluation of Titanium at Normal and Elevated Temperatures. George J. Heimerl and Paul F. Barrett. *National Advisory Committee for Aeronautics,* Technical Note 2269, Jan. 1951, 16 pages.

Includes comparisons with several other materials. Methods of evaluation, based upon use of stress-strain curves and structural indexes, for compressive loading without buckling, for column buckling, and for the buckling of long plates in compression or shear. 14 ref. (Q28, Q2, Ti, SG-h)

73-Q. Testing Machine for Combined Tension and Torsion. H. V. Pollard and H. J. Tapsell. *Engineering,* v. 171, Jan. 12, 1951, p. 58-59.

Apparatus at National Physical Laboratory in Britain has a capacity of 2400 lb. in tension and 1200 lb-in. in torsion. (Q27, Q1)

74-Q. Discussion on the Paper: "Plastic Strain and Hysteresis in Drawn Steel Wire," by R. S. Brown. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 319-320.

Covers above paper published in June 1949 issue (see item 19B-117, 1949). Includes author's reply. (Q23, F28, ST)

75-Q. Recent Developments in Hardness Testing. (In German.) Von P. Grodzinski. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 16, Nov. 1950, p. 335-340.

A new static-penetration and a new grinding-type hardness tester, both designed for testing very hard materials (including diamonds). (Q29)

76-Q. The Importance of the Effect of Susceptibility to Failure of Structural Steels for Large Structures on Their Weldability. (In German.) Walter Grosse. *Stahl und Eisen,* v. 70, Dec. 21, 1950, p. 1193-1204.

Shows that tensile and bending tests fail to measure adequately the strength properties of steels subject to three-dimensional stresses. Test methods proposed in Germany and in the U. S. Factors affecting the brittle-fracture susceptibility of different types of welded steel. 39 ref. (Q23, K9, CN)

77-Q. Effect of Increased Silicon and Manganese Content on the Properties of 10 and 14-Ton Heavy Forged Ingots of Openhearth Steel. (In German.) Wilhelm Meisemeyer. *Stahl und Eisen,* v. 71, Jan. 4, 1951, p. 8-15; disc., p. 15.

Effects of Si and Mn above normal amounts on primary crystallization, structure, and mechanical properties of forged steels. 30 ref. (Q general, M27, CN)

78-Q. Mechanical and Physical Properties of Pure Al and Several Al Alloys at the Temperature of Liquid Oxygen. (In German.) H. Mader. *Metall,* v. 5, Jan. 1951, p. 1-5.

Static tensile strengths, impact strengths, and shock resistances of welded and unwelded 99.5% Al sheets and of several Al alloys were determined at 20 and $-183°$ C. Thermal expansion coefficients and specific heats were also determined. Test apparatus and procedure. (Q27, Q6, P11, Al)

79-Q. Investigation of Mechanical Properties of Steel Resulting From Temperatures Similar to Those Produced During Welding. (In Russian.) N. N. Prokhorov and S. A. Kurkin. *Avtogennoe Delo* (Welding), v. 21, Oct. 1950, p. 6-10.

The probability of formation of hot tears during welding occurs at temperatures near the solidus line. Steels with a large temperature range of restoration of plasticity were found to be more liable to form hot tears, and steels which reduce their intercrystalline strength slowly during cooling of the weld are more subject to the influence of variations in welding conditions. Experimental data for different types of steel. Method of investigation. (Q23, K9, ST)

80-Q. Concerning the Type of Wear Which Takes Place Under Conditions of Dry Friction. (In Russian.) I. V. Kragelskii and E. M. Shvetsova. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Dec. 11, 1950, p. 681-683.

Investigated for binary combinations of W, Mo, Ta, Ni, Fe, Ca, Al, Pb, Bi, and Sn. Three types of interaction of surfaces were observed, reciprocal attraction of molecular fields, molecular adhesion of adjacent surfaces, and reciprocal intrusion of parts of the surfaces in contact. During sliding contact, these types of interaction result in different types of damage. (Q9)

81-Q. Experiments on Use of the Electron Microscope for Measurement of Particularly Small Impressions Obtained During Microhardness Tests. (In Russian.) M. M. Khrushchev and E. S. Berkovich. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Nov. 1950, p. 1645-1647.

Possibility of measuring dimensions of impressions made by 3 or 4-sided pyramidal indenters, even when size of the impressions is less than one micron. A replica is first made of the impression. This is then viewed in the electron microscope. Results obtained for synthetic ruby are illustrated. (Q29, M21)

82-Q. The Research of G. V. Uzhik in the Fields of Strength and Plasticity. (In Russian.) L. A. Glikman, N. N. Davidenkov, S. V. Serensen, Ya. B. Fridman, N. A. Shaposhmikov, N. P. Shchapov, and Ya. I. Yagn. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Nov. 1950, p. 1709-1715.

Analyzes theoretical bases of Uzhik's work on determination of tear resistance and indicates fallacies in his assumptions. Also attempts to show that Uzhik's theories of strength and plasticity are unfounded. 23 ref. (Q23)

83-Q. Further Remarks Concerning Resistance to Tear as a New Criterion of Mechanical Strength. (In Russian.) G. V. Uzhik. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Nov. 1950, p. 1716-1746.

Replies to the criticisms of Glikman and others. (See above abstract.) Extensive arguments and theoretical and experimental verification of his theories. 18 ref. (Q23)

84-Q. On the Effect of the Difference in Heat Treatments on the Yielding of a Carbon Steel. (In English.) Tomiya Sutoki and Kisuke Saito. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Oct. 1949, p. 143-147.

Results of experiments. (Q23, J general, CN)

85-Q. The Variation of Young's Modulus of a Binary Body-Centered Alloy Caused by the Formation of Superlattice. (In English.) Yoshio Shibuya. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Oct. 1949, p. 161-168.

Theoretical, mathematical analysis. Compares results with those of experiment. 14 ref. (Q21, N10)

86-Q. On the Internal Stress and the Internal Friction of Metals. I. On the Mechanism of Fatigue. II. The Change of the Internal Friction of Ni_3Fe During the Formation of Superlattice. (In English.) Hiroshi Sato. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Oct. 1949, p. 203-211.

Experimental apparatus and procedure. Results obtained. In Part I, carbon steels, Al and Al alloys were studied. (Q22, Q7, CN, Al, Ni, Fe)

87-Q. On Flattening Test of Steel Cylinder. (In English.) Ryozi Aida. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Oct. 1949, p. 255-259.

Standard "flattening" test used on steel compressed-gas cylinders. The cylinder is rejected if cracks are formed under stipulated conditions. Results of extensive investigation of this test. Composition of steel is not given. (Q5, ST)

88-Q. Contribution to the Study of Hardness and Work-Hardening Capacity of Metals. (In Spanish.) Jose Terraza Martorell. *Instituto del Hierro y del Acero,* v. 3, Apr.-June 1950, p. 132-149.

Different methods for determination of work hardening capacity of

metals, in particular those based on Meyer's law. Proposes a method for Meyer's constant determination and its use in establishing "limit of plasticity" and "elastic hardness." Experimental investigation proved applicability of theoretical method. 40 ref. (Q29)

89-Q. Microhardness Tester for Metals at Elevated Temperatures. Abner Brenner. *Journal of Research of the National Bureau of Standards,* v. 46, Feb. 1951, p. 126-131.

Apparatus devised for measuring the hardness of electrodeposited coatings at temperatures up to 900° C. in an inert atmosphere. Coatings thicker than about 0.07 mm. may be tested. Some typical measurements are given. (Q29)

90-Q. High Stress Fatigue of Aluminum and Magnesium Alloys. T. T. Oberg and W. J. Trapp. *Product Engineering,* v. 22, Feb. 1951, p. 159, 161, 163.

Series of graphs show variation of these properties with number of cycles for several Al and Mg alloys. (Q7, Al, Mg)

91-Q. Section Thickness in Meehanite Castings; Its Influence on Selection for Uniform Properties. C. R. Austin. *Machine Design,* v. 23, Feb. 1951, p. 130-131.

Mechanical properties of the different types of Meehanite cast iron are tabulated. Charts show effect of section thickness on tensile strength for each type. Three cross sections with hardness values indicated show degree of uniformity of this property in as-cast material. (Q23, Q29, CI)

92-Q. Summary of the Work of the Ship Structure Committee. K. K. Cowart. *Welding Journal,* v. 30, Feb. 1951, p. 65s-67s.

Work of the committee on the problem of failures in welded ships. Anticipated benefits of the research. (Q23, K9, T22, CN)

93-Q. Stress Studies of Welded Ship Structure Specimens. Wm. R. Campbell. *Welding Journal,* v. 30, Feb. 1951, p. 68s-76s; disc., p. 76s-78s.

Four ship specimens were tested in the Engineering Mechanics Section of the National Bureau of Standards for the Ship Structure Committee. The tests are part of a study of typical structural discontinuities in ships to determine the magnitude of stress concentrations and areas affected by discontinuities, and to furnish data necessary for improving current designs. Elastic stress distribution at room temperature, strain distribution prior to failure at 0° F., and energy to fracture at 0° F. Each specimen represents the intersection of a bottom longitudinal and a transverse bulkhead found in welded-tanker design. (Q25, T22, CN)

94-Q. Reports of International Welding Commissions. *Welding Journal,* v. 30, Feb. 1951, p. 78s, 90s, 104s.

"Residual Stresses and Stress Relieving," by R. Weck; and "Brittle Fractures," by A. Goelzer; presented June 5-10, 1950, in Paris. Apparently refers only to steels. (Q25, Q23, J1, ST)

95-Q. Some Metallurgical Aspects of Ship Steel Quality. H. M. Banta, R. H. Frazier, and C. H. Lorig. *Welding Journal,* v. 30, Feb. 1951, p. 79s-89s; disc., 89s-90s.

Semikilled 200-lb. laboratory heats can be made with ample reproducibility for use in studying the influence of chemical composition and deoxidation upon the transition-temperature characteristics of ABS class A and B plate-steels. Effect on transition temperature of C, P, V, S, Si, and Mn. (Q23, T22, CN)

96-Q. The Determination of Initial Stresses and Results of Tests on Steel Plates. Part I. The General Problem and Evaluation of the Method Used. E. W. Suppiger. **Part II. The Method of the Hole.** C. Riparbelli. **Part III. Experimental Techniques and Test Results.** Edward R. Ward. *Welding Journal,* v. 30, Feb. 1951, p. 91s-104s.

A nondestructive method for determining initial stresses. Strain-gage measurements are made in the vicinity of ⅛-in. holes. Complete details of mathematics involved in analysis of the data. Theory, test results, and recommended procedures. (Q25, CN)

97-Q. Time-Measurements Using the Joergensen-Weibel System. J. H. P. Koot. *Engineers' Digest,* v. 12, Jan. 1951, p. 24-26. (Translated and condensed from *Ingenieur,* v. 62, Oct. 27, 1950, p. O39-O43.)

The Joergensen-Weibel electronic chronograph was first used for determination of the velocity of artillery projectiles. It is now being employed to investigate the mechanical properties of materials, by determining the velocity of propagation of longitudinal sound waves in elastic materials, and correlating the value obtained for sonic velocity with strength and type of structure of the material considered. Includes circuit diagrams. (Q23, P10)

98-Q. The Design and Fabrication of Welded Structures Subjected to Repeated Loading. Part V (continued) **and Part VI.** R. Weck. *Welder,* v. 19, July-Sept. 1950, p. 61-70.

Fatigue strength of riveted joints and effect of single beads of weld metal on fatigue strength of plate steel. Values for fatigue strength of various types of butt welds obtained by different investigators. Effect of flaws revealed by radiographs on fatigue strength show that no clear relationship exists. (To be continued.) (Q7, K general, CN)

99-Q. Hydrogen Embrittlement of SAE 1020 Steel. J. B. Seabrook, N. J. Grant, and Dennis Carney. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 139-150; disc., p. 150-152.

Previously abstracted from *Journal of Metals.* See item 789-Q, 1950. (Q23, CN)

100-Q. Vanadium-Treated, Non-Aging, Rimming Steel for Deep-Drawing Quality Sheet. S. Epstein, H. J. Cutler, and J. W. Frame. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 153-160; disc., p. 160-161.

Previously abstracted from *Journal of Metals.* See item 408-Q, 1950. (Q general, G4, ST)

101-Q. Improved Test Bars for Standard and Ductile Grades of Cast Iron. Richard A. Flinn and R. Wayne Kraft. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 153-167; disc., p. 167-168.

Previously abstracted from preprint. See item 311-Q, 1950. (Q27, CI)

102-Q. Fatigue Data Summary. M. E. Annich. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 169-172; disc., p. 172-173. (Q7)

103-Q. Section Size Relationships in Nodular Iron. G. Vennerholm, H. Bogart, and R. Melmoth. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 174-183; disc., p. 183-184.

Influence of Mg residuals on mechanical properties of high-strength and high-ductility nodular iron. A microstructural analysis with numerous graphs and micrographs. (Q general, M27, CI)

104-Q. Composition and Properties of Gray Iron. Parts I and II. Richard Schneidewind and R. G. McElwee. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 312-330; disc., p. 330-332.

Previously abstracted from preprint. See item 313-Q, 1950. (Q23, E11, CI)

105-Q. Some Tests on Relaxation of Cast Iron. V. T. Malcolm and S. Low. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 456-458; disc., p. 458-459.

Previously abstracted from preprint. See item 312-Q, 1950. (Q25, CI)

106-Q. Steel Quality as Related to Test Bar Fractures. H. H. Johnson and G. A. Fisher. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 537-548; disc., p. 548-549.

Previously abstracted from preprint. See item 314-Q, 1950. (Q26, CI)

107-Q. Dilatometer Studies of Nodular Cast Iron. N. A. Ziegler, W. L. Meinhart, and J. R. Goldsmith. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 637-648; disc., p. 648-649.

Previously abstracted from preprint. See item 315-Q, 1950. (Q23, P11, CI)

108-Q. Waterproofing Electrical-Resistance Strain Gauges. J. D. Todd. *Engineering,* v. 171, Jan. 19, 1951, p. 67.

Method developed for concrete work in which the gage is completely encased in brass foil. The method should be applicable to other fields of work. (Q25, T1)

109-Q. The Deformation of Copper and Iron Crystals by Unidirectional Abrasion. D. M. Evans, D. N. Layton, and H. Wilman. *Proceedings of the Royal Society,* ser. A, v. 205, Jan. 22, 1951, p. 17-30.

In order to test the theory that a new deformation process, rotational slip, occurs prominently when crystal surfaces are abraded unidirectionally, an approximately (110) face of a Cu crystal was smoothed by electropolishing, abraded, and examined by electron diffraction after various stages of etching. In iron, also, large rotation of parts of the crystal surface occurred when crystals were abraded parallel to either (100), (110), or (111) planes which were normal or steeply inclined to the surface. Interpretation in terms of rotational slip is fully supported by previous metallographic observations on Cu, Al, and Fe and by electron-diffraction evidence of the structure of beaten metal foils. 33 ref. (Q24, M26, Cu, Fe)

110-Q. The Stresses and Strains in a Partly Plastic Thick Tube Under Internal Pressure and End-Load. D. N. de G. Allen, and D. G. Sopwith. *Proceedings of the Royal Society,* ser. A, v. 205, Jan. 22, 1951, p. 69-83.

Many solutions have been proposed for the stress distribution in a thick tube subjected to an internal pressure sufficient to cause yield at the interior, usually in connection with autofrettage of gun barrels. These all give the same values for radial and circumferential stresses, but differ in axial stresses. Reviews these solutions and presents an analysis making fewer assumptions; this is developed into a form suitable for practical application. (Q25, U7)

111-Q. (Book) **Twelve Lectures on Theoretical Rheology.** Ed. 2. Markus Reiner. 162 pages. 1949. Interscience Publishers Inc., 215 Fourth Ave., New York 3, N. Y.

An introduction to that branch of physics which deals with the deformation and flow of materials. Seven-page bibliography. (Q24)

R

CORROSION

42-R. Corrosion in Amine Gas Treating Plants. F. C. Riesenfeld and C. L. Blohm. *American Society of Mechanical Engineers,* Paper 50-Pet-16, 1950, 24 pages.

Experimental work done with small and full-scale heat exchangers containing tubes of various steels and alloys. Results indicate that in glycol-amine plants, 4-6 Cr, 0.5 Mo steel and aluminum 3S are suitable for heat-exchanger tubes. Types 304 and 316 stainless steel, monel, Inconel and Carpenter 20 steel were found to be corrosion resistant in systems using aqueous amine solutions. Discusses corrosion of carbon steel in both aqueous and glycol-amine gas-treating plants.
(R9, R5, Al, Ni, AY, CN, SS)

43-R. Sodium Nitrate as an Inhibitor Against the Attack of Sea-Water on Steel. III. Inhibitor in Sea-Water Distilled-Water Mixtures. T. P. Hoar. *Journal of the Society of Chemical Industry,* v. 69, Dec. 1950, p. 356-362.

Shows that corrosion of mild steel by sea-water distilled-water mixtures at 25 or 60° C. is completely inhibited by presence of a percentage of $NaNO_2$ greater than 1/5 of the sea-water percentage. Similar additions inhibit the corrosion of white metal by such waters and decrease the corrosion of Cu. They have no appreciable influence on corrosion of brass at 25° C. Corrosion-potential measurements at 25° C. indicate that the nitrite is an anodic inhibitor. 14 ref.
(R10, CN)

44-R. Electrochemical Behaviour of Paint Films in Sea-Water. A Suggested Mechanism. J. T. Crennell. *Journal of the Society of Chemical Industry,* v. 69, Dec. 1950, p. 371-373.

The cathodic character of painted or otherwise partially screened steel in sea-water is explained by the retention behind the paint-film of the products of reaction of local corrosion couples. Local anodes behind the film will be suppressed by accumulation of ferrous ions. Alkalinity produced at local cathodes renders the steel passive and so encourages passage of further current in the same direction. Experiments show that an iron electrode transferred from neutral to alkaline salt solution becomes temporarily anodic, then quickly becomes cathodic as passivity develops. (R1, ST)

45-R. Ocean Test Tube. Welman A. Shrader. *Aeronautical Engineering Review,* v. 10, Jan. 1951, p. 24-27.

Corrosion and marine-fouling test facilities at Kure Beach, N. C. (R11)

46-R. Results of Recent Tests on Resistance to Weld Decay of Low-Carbon Stainless Steels. G. R. Bolsover. *Sheet Metal Industries,* v. 28, Jan. 1951, p. 73-76.

Results of tests on a series of British compositions in which the specimens were reheated to 650° C. for 30 min., immersed in a boiling $CuSO_4$-H_2SO_4 solution for 72 hr., bent 90° over a radius of 3 ft. and examined by the naked eye for signs of intergranular collapse on the surface. (R2, SS)

47-R. Some Aspects of the Protection of Iron and Steel Against Corrosion. U. R. Evans. *Journal of the Oil & Colour Chemists' Association,* v. 33, Oct. 1950, p. 452-458; disc. p. 457-458.

Mechanism of high-temperature corrosion by water and oxygen, of inhibition of corrosion by Pb soaps, and of corrosion prevention by use of paints containing metallic Zn.
(R1, R10, L26, CI, ST)

48-R. Corrosion of Steel in Laminar Flowing Water. (In English.) J. L. Mansa. *Acta Chemica Scandinavica,* v. 4, no. 8, 1950, p. 1263-1274.

Apparatus and procedure for investigation. Qualitative results. Attempts to obtain quantitative data have not been successful to date.
(R4, ST)

49-R. Corrosion Due to Tuberculation in Water Systems. I. The Effect of Calgon on the Potential of Iron Electrodes in Differential Aeration Cells With Running Tap Water. II. The Effect of Calgon on the Potential of Zinc and Copper Electrodes in Differential Aeration Cells With Running Tap Water. (In English.) J. L. Mansa and Waclaw Szybalski. *Acta Chemica Scandinavica,* v. 4, no. 8, 1950, p. 1275-1299.

Experimental apparatus and results. 38 ref. (R4, Fe, Zn, Cu)

50-R. The Importance of the Reactivity of Metal Surfaces in Electrochemical Reactions. (In German.) Kurt Wickert. *Metalloberfläche,* sec. A, v. 4, Dec. 1950, p. 181-186.

Theoretical analysis and critical discussion of existing theories concerned with the above, as an aid to the better understanding of corrosion problems. (R1, P13)

51-R. Corrosion Resistance of Anodically Polished and "Eloxidized" Aluminum Mirrors. (In German.) W. Kerth. *Metalloberfläche,* sec. A, v. 4, Dec. 1950, p. 190.

Experiments made under corrosive conditions showed that Al mirrors coated with a thin film of Al_2O_3 are highly resistant to corrosion. (R general, L19, Al)

52-R. Attacking Corrosion: Billion-Dollar Problem. *Modern Industry,* v. 21, Jan. 15, 1951, p. 18, 20, 22, 24.

International Nickel Co.'s new Harbor Island corrosion testing station at Wrightsville Beach, N. C. (R11)

53-R. X-ray Diffraction Study of the Oxidation Characteristics of Nickel Pickled Sheet Iron as Related to Enamel Adherence. G. S. Douglas and J. M. Zander. *Journal of the American Ceramic Society,* v. 34, Feb. 1951, p. 52-59.

Systematic study of effect of nickel pickling on oxidation of bare enameling iron and of reactions taking place under groundcoat enamels. 22 ref. (R2, L28, CN)

54-R. Effect of Water on the Interaction Between Benzene Solutions of Palmitic Acid and Metal Oxides. J. K. Lancaster and R. L. Rouse. *Research,* v. 4, Jan. 1951, p. 44-46.

Tingle recently showed that freshly formed metal-oxide surfaces require treatment with water before they will react with a fatty acid. Experiments were planned to discover whether, by use of very dry conditions, chemical reaction would be prevented. Heat changes accompanying the interaction between the fatty acid solution and the powder were followed by means of a calorimeter. Results indicate that reaction rate between a metal oxide and a fatty acid depends on amount of water present; and drops to zero if water is absent. (R5, P13)

55-R. A Micro Solution-Potential Measuring Technique. L. W. Smith and V. J. Pingel. *Journal of the Electrochemical Society,* v. 98, Feb. 1951, p. 48-50.

Solution-potential measurements are used to predict corrosion susceptibility of metals or alloys when exposed to various media. Technique developed for measuring the solution potential of a metal or alloy on a micro scale. Consists of electrically insulating the polished and etched surface of the metal specimen with a transparent plastic film, puncturing the film over any desired microconstituent with the aid of a specially adapted hardness tester, and then determining the solution potential at the point of puncture.
(R11)

56-R. Dichromate Reduction Rate at a Steel Surface in Air-Free, Acetic Acid Solution. Norman Hackerman and Ray M. Hurd. *Journal of the Electrochemical Society,* v. 98, Feb. 1951, p. 51-56.

A system by which aqueous solutions of $K_2Cr_2O_7$ and of acetic acid can be brought in contact with steel coupons in the absence of air. Rate of reduction of the dichromate was determined as a function of time by titration and spectrophotometrically. Changes in pH were also followed. Rates were measured with various initial concentrations for several areas of steel surface. Effects of temperature, presence of NaCl or oxygen, and order of addition of the solutions were studied. A mechanism for the reaction and of the corrosion inhibition is proposed.
(R1, R10, ST)

57-R. Potential-pH Diagram of Lead and Its Applications to the Study of Lead Corrosion and to the Lead Storage Battery. Paul Delahay, Marcel Pourbaix, and Pierre Van Rysselberghe. *Journal of the Electrochemical Society,* v. 98, Feb. 1951, p. 57-64.

Reactions and equilibrium equations of the system Pb-H_2O are used in the construction of the diagram. Some important features of the diagram, in particular the solubilities of oxides and hydroxides and some of the important oxidation-reduction reactions. Modified forms of the diagram. Important features of the behavior of lead storage batteries on the basis of these diagrams. 11 ref.
(R1, Pb)

58-R. Potential-pH Diagram of Silver; Construction of the Diagram—Its Applications to the Study of the Properties of the Metal, Its Compounds, and Its Corrosion. Paul Delahay, Marcel Pourbaix, and Pierre Van Rysselberghe. *Journal of the Electrochemical Society,* v. 98, Feb. 1951, p. 65-67.

The diagram was constructed on the basis of methods and conventions previously described and using the available thermodynamic and electrochemical data. A derived diagram showing domains of corrosion, passivity, and passivation is also presented. 11 ref. (R1, R10, Ag)

59-R. Control of Condensate Return Line Corrosion. William A. Tanzola. *Tappi,* v. 34, Jan. 1951, p. 25-29.

The basic factors involved and mechanism of the corrosion reactions. Sources of the corrosive gases, O_2 and CO_2, and methods of removal of dissolved O_2 and reduction of CO_2.
(R4, ST)

60-R. Corrosion. IX. The Protection of Electric Equipment from Corrosion in Pulp and Paper Mills. G. W. Knapp. *Paper Trade Journal,* v. 132, Jan. 19, 1951, p. 18, 20, 22, 24, 26.

Various protective methods.
(R5, T29)

61-R. Stainless Steel Castings, Valves and Fittings Beat Corrosion in Paper Industry. N. S. Mott. *Paper Trade Journal,* v. 132, Jan. 26, 1951, p. 31-32, 34, 36.

Typical physical and mechanical properties of cast corrosion resistant alloys for the above; also, alloy recommendations for corrosion resistance to chemicals commonly used in the paper industry. Includes Ni and high-Ni alloys. 12 ref.
(R5, T29, SS, Ni)

62-R. Notes on the Electrochemical Behaviour of Paint Film on Steel in

Sea-Water. J. T. Crennell. *Journal of the Society of Chemical Industry,* v. 69, Suppl. Issue 1, 1950, p. S36-S38.

Painted steel surfaces are normally cathodic to bare steel. This is a surprising fact, which appears to contradict the well-established "differential aeration" theory. In seeking an explanation, it was found that neither the chemical nor the physical nature of the paint film is a determining factor; steel imperfectly screened from the electrolyte by any material becomes cathodic. This is in contrast to the preferential corrosion often occurring in crevices. Some practical implications of the observations are suggested. (R1, L26, ST)

63-R. Durability of Aluminium and Its Alloys—Marine Exposure. *Light Metals,* v. 13, Nov.-Dec. 1950, p. 556-563; v. 14, Jan. 1951, p. 36-43.

The theory and practice of test schedules and protective measures. 10 ref. (R4, Al)

64-R. The Influence of Surface Contamination on the Corrosion of Magnesium Manganese Sheet. L. Rakowski. *Metallurgia,* v. 42, Dec. 1950, p. 362-366. (Translated from *Métaux & Corrosion.)*

Previously abstracted from original. See item 6D-35, 1949. (R2, L15, Mg)

65-R. The Effect of Surface Finish on the Stress-Corrosion Properties of Aluminium—7% Magnesium Alloy. S. E. Hadden and E. C. W. Perryman. *Metallurgia,* v. 42, Dec. 1950, p. 392-396.

Stress-corrosion life of the alloy in sheet form, in a susceptible condition, is dependent on state of the surface. Increase in stress-corrosion resistance results from treatments which introduce into the surface compressive stresses acting in opposition to the tensile stresses operating during stress-corrosion. Production of a Mg-impoverished surface layer also causes an improvement. (R1, Al)

66-R. Corrosion-Fatigue of Metals; A Critical Survey. A. J. Gould. *Iron and Steel,* v. 24, Jan. 1951, p. 7-10.

20 references. (R1)

67-R. "White Rust" Formation on Zinc. P. T. Gilbert and S. E. Hadden. *Journal of the Institute of Metals,* v. 78, Sept. 1950, p. 47-70.

Conditions under which Zn corrodes in moist atmospheres with formation of a voluminous white corrosion product known as "white rust" were investigated. The corrosion product usually consisted of basic zinc carbonate, sometimes mixed with zinc oxide. In the absence of CO_2, ZnO only was detected. Rate of corrosion increased considerably when substances such as SO_2, HCl, or organic acids were present in the atmosphere, or when galvanizing-flux residues remained on the Zn surface. Rate of attack decreased in the presence of NH_3 or high concentrations of CO_2. Precautions necessary to avoid white rusting in storage or transit. (R3, Zn)

68-R. Review of Published Information on the Oxidation and Scaling of Copper and Copper-Base Alloys. R. F. Tylecote. *Journal of the Institute of Metals,* v. 78, Nov. 1950, p. 259-300.

Part I: methods used in experimental work on oxidation of metals, including weighing, optical, and electrolytic methods for measurement of oxidation rates, and X-ray and electron-diffraction methods for study of oxide-film structures. Part II: rate of oxidation of Cu and the structure of the films formed. Part III: influence of alloying elements and some effects of variations in the oxidizing atmosphere. Part IV: practical aspects of oxidation, with particular reference to the adherence of troublesome scales. 139 ref. (R2, R11, Cu)

69-R. From a Metallurgist's Notebook; Cracked Brass Pins. H. H. Symonds. *Metal Industry,* v. 78, Jan. 12, 1951, p. 27-28.

Cracking of tin-coated brass pins, mounted on cards, after one week's display in a shop window, was investigated. Results of microstructural examination indicated that stress-corrosion was the cause of cracking. Possible remedies. (R1, Cu)

70-R. Electrochemical and Chemical Corrosion. (In German.) H. Grubitsch, E. Voutilainen, and H. Vayrynen. *Werkstoffe und Korrosion,* v. 1, Dec. 1950, p. 477-481.

Experiments made to study factors which influence the corrosion of iron exposed to residual currents. 31 ref. (R1, Fe)

71-R. Protection of Underground Metallic Structures Against Corrosion. (In Russian.) *Vestnik Akademii Nauk SSSR* (News of the Academy of Sciences of the USSR), v. 20, Oct. 1950, p. 110-111.

The work of Akimov on cathodic protection by use of Mg and Mg-alloy anodes. (R10)

72-R. Pit or Cavity-Corrosion of High Chromium Stainless Iron Caused by Contact With Non-Conductive Substances and Its Prevention. (In English.) Hikozo Endo. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Dec. 1949, p. 349-356.

When the surface of chromium-iron comes in contact with nonconductive substances such as glass, cork, or rubber stoppers, or with noble metals like Pt and Au, a narrow crevice acting as capillary is formed and corrosion takes place in the pit or cavity at the point of contact. Specimens containing 22% Cr, 22% Cr + 3% Mo, 22% Cr + 7% Mo, and 35% Cr annealed at 900° C. and quenched in water from 1090 or 1300° C. were tested in 5% $FeCl_3$ solution to ascertain whether pit or cavity corrosion takes place on bringing them in contact with nonconductors. Mechanism of the phenomenon and prevention of these contact effects. (R2, SS)

73-R. On the Improvement of the Imitation Gold. (In English.) Tosihiko Okamura and Takasi Kimura. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Dec. 1949, p. 473-478.

"Imitation gold" tarnishes upon contact with perspiration. Anti-tarnishing properties of ternary alloys of Cu, Zn, and Al, also effects of fourth elements upon them, were investigated. It was found that $\alpha + \beta$ alloy is generally the most resistant and that a slight addition of Pb, Fe, Mn, or Si imparts tarnish resistance, while addition of Si is followed by a remarkable increase of hardness. (R2, Cu, Zn, Al)

74-R. Corrosion Resistance of Cast Irons in Dilute Acids. (In English.) Ichiro Iitaka and Kazuhiko Sekiguchi. *Reports of the Casting Research Laboratory,* Jan. 1950, p. 4-6.

Experiments on effect of Cr content on acid resistance of cast irons and on effects of added metals on acid resistivity of high-silicon irons. (R5, CI)

75-R. Stress-Corrosion of Austenitic Steels. (In Spanish.) Walter Tofaute and H. J. Rocha. *Instituto del Hierro y del Acero,* v. 3, Apr.-June 1950, p. 101-110.

Mechanism of stress-corrosion, especially for 18-8 steels. Effects of added elements such as Ti, V, W, Mo, and Cb; concentration of Ni and Cr; and resulting crystal structure. (R1, SS)

76-R. Particular Phenomena Accompanying Oxidation of Heat Resistant Steels and Alloys. (In Spanish.) Walter Tofaute and G. Bandel. *Instituto del Hierro y del Acero,* v. 3, July-Sept. 1950, p. 177-186.

Results of a short study, especially formation of protective oxide layers, their composition, crystal structure, and factors involved in such oxide formation. Experimental methods. (R2, CN, AY)

77-R. Heat Resistant Alloy Steels Particularly Suitable for Temperatures Up to 600° C. in the Presence of Water Vapor. (In Spanish.) Walter Tofaute. *Instituto del Hierro y del Acero,* v. 3, July-Sept. 1950, p. 195-202.

Cr-Mo-W-V, Cr-Ni-W, Cr-Ni-W-Ti, Cr-Ni-Ti and Cr-Mn-V steels suitable for 600° temperatures were investigated. Compositions, mechanical and chemical properties, and crystal structure. Methods of mechanical and corrosion testing. (R4, Q general, SG-g, h, AY, SS)

78-R. Fretting Corrosion in Aircraft and Aircraft Accessories. Adolph E. Rahm and Harry F. Wurster. *Lubrication Engineering,* v. 7, Feb. 1951, p. 22-23, 26-28, 40.

Parts subject to "fretting corrosion" or "friction oxidation" are enumerated for fixed and rotary-wing aircraft. Experiences with helicopter rotor-head main-thrust bearings, including design and lubricant changes made to improve serviceability. Modified test apparatus and procedure developed. Relative merits of brass and steel bearings with three types of surface finish and using ten different lubricants. 16 ref. (R1, Q9, T7, ST, Cu)

79-R. Corrosion by Stray Currents. N. P. Peifer. *American Gas Association Monthly,* v. 33, Feb. 1951, p. 24-26.

How corrosion engineers use stray currents from street-railway and mine-haulage systems for free cathodic protection of pipelines. (R10, ST)

80-R. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 43, Feb. 1951, p. 63A-64A, 66A.

"Ringworm" corrosion in oil-well equipment. Results of investigation of this type of corrosion illustrate the importance of metallurgical factors in solving some corrosion problems. (R2, ST)

81-R. Protection of Well Casings Against External Corrosion. R. E. Hammond and S. P. Ewing. *World Oil,* v. 132, Feb. 1, 1951, p. 154-156, 158.

Investigation of leaks in the Loudon Pool, Illinois, caused by external corrosion by the Tar Springs formation, in which permeable salt-water sand overlays the producing zones. It was found that more than 90% of this corrosion was caused by electrolytic currents. To stop it, insulating nipples or flanges were placed between flow lines and casings. Records before and after insulators were installed indicate an ultimate saving for this group of wells of $1,700,000. (R10, CN)

82-R. Corrosion and Stress Corrosion Properties of a High Strength Aluminum-Zinc-Magnesium-Copper Casting Alloy. R. A. Quadt and E. C. Reichard. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 525-529; disc., p. 529. (R1, Al)

83-R. Physics of Metals. Oxidation of Steels and of Alloys. (In French.) X. Wache. *Métaux & Corrosion,* v. 25, Nov. 1950, p. 267-276.

Surface oxidation was investigated at high temperatures, with emphasis on Fe, Cu, and Ni-base alloys. In all of the alloys investigated, it was found that distribution of the component elements in the oxide layer does not correspond to their concentration in the original alloy. 17 ref. (R2, Fe, Cu, Ni, ST)

84-R. Phenomena of Internal Oxidation. (In French.) J. Druyvesteyn. *Métaux & Corrosion,* v. 25, Nov. 1950, p. 277-282.

Deals especially with the better-known and simpler types. Diffusion of oxygen in Ag or Cu alloys; mechanical properties of Ag or Cu alloys; microscopic investigation of precipitation in the same alloys; application of thermodynamics to internal oxidation of various nonferrous metals; and lattice dimensions of vacuum-cast Ag and several Ag alloys. 15 ref. (R2, Ag, Cu)

85-R. Oxidation of Cobalt at High Temperatures. (In French.) Gabriel Valensi. *Métaux & Corrosion,* v. 25, Nov. 1950, p. 283-291.

Previously abstracted from *Metallurgia Italiana.* See item 273-R, 1950. (R2, Co)

86-R. Electrochemical Behavior of Iron in Solutions of Oxidizing Agents. II. Anodic Polarization of Iron in Solutions of Oxidizing Agents. (In Russian.) L. Ya. Gurvich and G. V. Akimov. *Izvestiya Akademii Nauk* (Bulletin of the Academy of Sciences of the USSR), Section of Chemical Sciences, Nov.-Dec. 1950, p. 565-572.

Experimental investigation of behavior of iron in HNO_3 solutions of different concentrations (up to 0.1 *N*). Anodic polymerization of iron in solutions of $KMnO_4$, $K_2Cr_2O_7$, and $(NH_4)_2S_2O_8$ was also studied. (R5, R1, Fe)

87-R. A Rapid Method for Control of Quality of Metallurgical Lead. (In Czech.) Jan Kaloc. *Hutnické Listy,* v. 5, Nov. 1950, p. 450-453.

Effect of small amounts of impurities on corrosion resistance of lead to various chemicals. Two methods for rapid quality control: determination of "breakdown" point in H_2SO_4; and an aqua regia test. Dependence of breakdown point on quantity and type of impurity was tested using Pb of less than 99.99% purity. (R5, Pb)

88-R. (Book) **Monel and Some Other High-Nickel Alloys Versus Sulphuric Acid.** 72 pages. 1950. Henry Wiggin & Co., Ltd., Wiggin St., Birmingham 16, England. Gratis.

Effects of temperature, aeration, agitation, and acid concentration on corrosion resistance of monel, nickel, Ni-Resist, Inconel, and other Ni-Cr alloys when attacked by H_2SO_4. Results of numerous corrosion tests made in the plant under actual operating conditions. (R5, R11, Ni)

S

INSPECTION AND CONTROL

40-S. Instrumentation for Metallurgy. R. R. Webster. *Metal Progress,* v. 59, Jan. 1951, p. 86-92.

Developments of past ten years as applied to various metallurgical operations, including analysis, testing, inspection, and research. (S general)

41-S. German and American Stainless Compared. C. A. Zapffe. *Iron Age,* v. 167, Jan. 25, 1951, p. 56-60.

Currently used compositions of wrought stainless steels have recently been standardized in Germany in a manner similar to AISI classifications in the U. S. Comparison of standard German and American listings. (S22, SS)

42-S. Light Metals and Their Alloys Codified. R. B. Smith. *Iron Age,* v. 167, Jan. 25, 1951, p. 65-70.

New, uniform system is now officially adopted by ASTM. It will be combined with the temper designations in use since 1948. Extensive tables give ASTM and commercial designations plus chemical composition limits and applicable ASTM specification for a wide-variety of Al and Mg alloys. (S22, Al, Mg)

43-S. Engineering Aspects of Tool and Die Welding. Part II. Classification of Tool and Die Steels. Arthur R. Butler. *Tool Engineer,* v. 26, Jan. 1951, p. 42-45.

Compositions and properties of the various types. (S22, T6, TS)

44-S. Statistical Quality Control Cuts Inspection Costs $100,000. David C. Peterson. *Steel,* v. 128, Jan. 29, 1951, p. 58-62, 80, 82.

During the last 2½ years, Stewart-Warner effected the above savings through replacement of 100% inspection by sampling inspection of Alemite hydraulic fittings. Description of system includes tables and graphs. (S12)

45-S. Report of Committee 15—Iron and Steel Structures. J. L. Beckel, chairman. *American Railway Engineering Association, Bulletin,* v. 52, Jan. 1951, p. 445-478.

Reports on revisions of rules for rating existing iron and steel bridges; revisions of specifications for movable railway bridges; design of steel bridge details; and specifications for design of corrugated metal culverts, including corrugated metal arches. (S22, T26, ST)

46-S. Emission Spectrography. J. Sherman. "Physical Methods in Chemical Analysis". Vol. I, Academic Press Inc., New York, 1950, p. 255-332.

Laboratory setup and economics. Spectrographs, densitometers, excitation sources, material and electrode preparation, the photographic plate, and analysis. 32 ref. (S11)

47-S. An Electronic Recording Analytical Balance. Idas W. Lohmann. *Review of Scientific Instruments,* v. 21, Dec. 1950, p. 999-1002.

The instrument is free of mechanical connections with the balance beam, direct-reading, sensitive, and rapid. All mechanical and electrical contactors have been eliminated from the instrument proper. The construction is simple. For work requiring a continuous record of changes in weight with respect to time, the instrument should prove to be most valuable. (S11)

48-S. A Method for Determining Uranium and Thorium in Rocks by the Nuclear Photographic Plate. J. W. Bremner. *Proceedings of the Physical Society,* v. 64, sec. A, Jan. 1, 1951, p. 25-31.

A nuclear photographic emulsion which has been in contact with material containing traces of uranium and thorium shows, on processing, α-ray stars arising from atoms which have undergone several successive disintegrations during exposure. The relative frequency of the various multiple stars, which depends on the U-Th ratio, is evaluated to show the possibility of determining these elements by star counting. (S11, S19, U, Th)

49-S. Supersonic Examination of Boiler Plate and Welded Seams. *Engineering,* v. 171, Jan. 5, 1951, p. 29-30.

Problems involved in interpretation of results of supersonic testing and radiographic inspection. Methods used by Babcock & Wilcox, Ltd. Argues that present British Standard Specifications are unnecessarily severe. It may be possible to reduce greatly the amount of radiographic work by proper application of supersonic testing, with accompanying cost savings. (S13)

50-S. Temperature Control of Slot or Batch Type Steel Forging Furnaces. J. A. Hartnell. *Journal of the Birmingham Metallurgical Society,* v. 30, Dec. 1950, p. 152-155.

(S19, F21)

51-S. A New Surface Pyrometer. M. D. Drury and T. Land. *Journal of the Birmingham Metallurgical Society,* v. 30, Dec. 1950, p. 156-159.

Development of a new instrument of high accuracy for measurement of the surface temperatures of hot metal in the form of ingots, sheets, and strips as well as furnace walls and other surfaces. It is based on collection of thermal radiation. (S16)

52-S. Gamma, X-Ray Control Piping Quality. *Industry & Welding,* v. 24, Feb. 1951, p. 44, 65.

Use of Gamma and X-ray inspection on welds in Texas-to-Ohio natural-gas pipe line. Arc welding operations. (S13, K1, CN)

53-S. Alternate Steels Useful as Substitutes for Critical Materials. Edwin Laird Cady. *Materials & Methods,* v. 33, Jan. 1951, p. 62-63.

Use of the leaner NE steels (now called Tentative Standard steels) which are again proving valuable as replacements for scarce alloy grades. (S22, AY)

54-S. Tool Refinements Aid Buick Output. Herbert Chase. *Modern Machine Shop,* v. 23, Feb. 1951, p. 162, 164, 166.

Black-light unit used to check carbide bits for cracks also helps to spot causes of failures. (S13, C-n)

55-S. A Method of Estimating Thickness of Hot-Metal Mixer Linings. L. L. Wells. *Brick & Clay Record,* v. 118, Feb. 1951, p. 49-50.

Use of "Tempilstiks" (temperature-indicating crayons) for approximate measurement of shell temperatures. From these temperatures, lining thicknesses can be estimated with sufficient accuracy for most purposes. Test data were gathered over a period of years. (S16)

56-S. Automatic Inspection of Pipe. J. E. Clarke, R. A. Peterson, T. J. Dunsheath. *Welding Engineer,* v. 36, Feb. 1951, p. 38-42.

New magnetic-particle equipment which inspects seam-welded pipe just after it leaves the welding wheels. (S13, CN)

57-S. Light Absorption Spectrometry. M. G. Mellon. *Analytical Chemistry,* v. 23, Jan. 1951, p. 2-7.

A review. 217 ref. (S11)

58-S. Automatic Operations in Analytical Chemistry. Gordon D. Patterson, Jr., and M. G. Mellon. *Analytical Chemistry,* v. 23, Jan. 1951, p. 101-115.

A review. 483 ref. (S11)

59-S. Determining Traces of Oxygen in Bismuth Metal. E. S. Funston and Sherman A. Reed. *Analytical Chemistry,* v. 23, Jan. 1951, p. 190-191.

Hydrogen-reduction procedure and apparatus. 11 ref. (S11, Bi)

60-S. The Detection of Columbite by Ultraviolet Light. Robert A. Mackay. *Bulletin of the Institution of Mining and Metallurgy,* Jan. 1951; *Transactions,* v. 60, pt. 4, 1950-51, p. 129-131.

A simple flux, used in a metal dish, can render columbite fluorescent to ultraviolet light and so make its detection in a concentrate relatively easy. (S11, Cb)

61-S. A Test for the Dimensional Stability of Gauges by an X-Ray Diffraction Method. C. Wainwright and L. W. Nickols. *Metallurgia,* v. 42, Dec. 1950, p. 401-404.

Method in which breadth of the lines in the X-ray diffraction pattern of the steel is measured by use of a Geiger-Müller counter spectrometer. The method will not, however, distinguish between stable and unstable conditions if the gage has been so severely heated in machining as to cause a structural change in the surface layers. (S14)

62-S. Current Light-Alloy Specifications. (Corrected to December 1,

1950). *Light Metals,* v. 14, Jan. 1951, p. 18-32.

British specifications.
(S22, Al, Mg)

63-S. Spectrochemical Analysis of Steelmaking Slags. C. Georg Carlsson and John T. M. Yü. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 273-280.

Procedure for determination of $CaO-SiO_2$ ratio of openhearth and electric-furnace slags and for complete analysis of such slags. The sample is mixed with graphite powder and pressed into a briquette, which is subjected to a low-tension arc-like triggered spark for excitation. Percentages of the oxides are calculated by use of a "mutual standard method". Accuracy compares favorably with routine chemical analysis, and time necessary for a complete analysis is only about ½ hr. 26 ref. (S11, D2, D5, ST)

64-S. Contribution of the Source Unit to Variability in Spectrographic Analysis. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 325-328.

A more comprehensive study of source behavior, based on the technique outlined in an earlier paper, has confirmed that 20-50% of the total error in spectrographic ferrous analysis, using photographic recording, can be traced to source contribution. Some of the factors affecting this contribution and possibilities of improved source performance are considered. (S11, Fe, ST)

65-S. A Statistical Study of the Behaviour of Spectrographic Source Units. H. T. Shirley, A. Oldfield, and H. Kitchen. *Journal of the Iron and Steel Institute,* v. 166, Dec. 1950, p. 329-338.

Influence of factors operative during excitation. Comparison of various types of excitation unit, particularly of the ordinary uncontrolled Hilger high-voltage condensed spark unit and the Metro-Vickers controlled low-voltage source. Most favorable results are obtained with the simple Hilger unit, operating with a graphite auxiliary electrode and a 2½-mm. gap. 10 ref. (S11, AY)

66-S. Naval Gearing: War Experience and Present Development. J. H. Joughin. *Engineering,* v. 171, Jan. 5, 1951, p. 25-27; Jan. 12, 1951, p. 55-56. (A condensation.)

Various examples of failures and excessive wear. Causes and possible remedies on the basis of work of the National Physical Laboratory in Britain. (S21, Q9, CN)

67-S. Advances in the Field of Optical Pyrometry in the Years 1940-1950. (In German.) Joachim Euler. *Zeitschrift für angewandte Physik,* v. 2, Dec. 10, 1950, p. 505-509.

Reviews literature. 54 ref. (S16)

68-S. An Improved Type of Thickness Tester. (In English.) Kan-ichi Kamiyoshi. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Oct. 1949, p. 335-339.

Magnetic tester by which thickness of a metal wall can be measured when access cannot be gained to both sides. It is portable, simple in operation, and durable, and can be applied to nearly all sorts of curved surfaces. Maximum thickness is about 10 mm. for Cr-Mo steel and larger for mild steel, and accuracy is about 10% for mild steel 5 mm. thick. (S14)

69-S. On the Flow of the Magnetic Flux in a Metal Plate for a Thickness Gage. (In English.) Sakae Tanaka. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 1, Dec. 1949, p. 451-456.

A convenient method for field measurement of the thickness of a metal plate only one side of which is readily accessible. The problem of the three-dimensional flow of magnetic flux penetrating into a metal plate, when steady or alternating magnetomotive force is supplied between two points on its surface. Results obtained by calculations were verified experimentally. (S14)

70-S. Electric Controllers for Laboratory Furnaces. M. H. Roberts. *Electronic Engineering,* v. 23, Feb. 1951, p. 51-54.

Two designs of temperature controller for laboratory electric resistance furnaces. The general design is based on previous circuits used by Prosser, Coates, and Yates, but more emphasis is placed upon simplicity of construction, operating economy, use of standard components, and design for maximum life expectation and minimum probability of breakdown. The first design gives simple two-position control while the second gives proportional control from maximum to nearly zero. (S16)

71-S. Measurement of Surface Smoothness. Henry L. Kellner. *Proceedings, American Electroplaters' Society,* v. 37, 1950, p. 105-122; disc., p. 122-124.

Microscopic methods, the micro-interferometer, electromechanical instruments, acoustical methods, replica techniques, the electron microscope, and methods involving reflectance. 23 ref. (S15)

72-S. Measurement of Surface Roughness of Electrodeposited and Electropolished Surfaces by Means of the Microinterferometer. Arthur G. Strang and Fielding Ogburn. *Proceedings, American Electroplaters' Society,* v. 37, 1950, p. 125-136.

The Zeiss micro-interferometer developed in Germany during World War II. Interpretation of micrographs; possible applications. Includes an optical diagram of the apparatus and numerous micrographs. (S15)

73-S. Control of Liquid-Steel Temperatures in Hearth and Ladle. F. A. VonGruenigen and W. D. Lawther. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 114-127; disc., p. 127-130.

Results obtained through the use of the bath pyrometers. An extensive series of measurements of molten-metal temperatures in the foundry. (S16, D2, D9, ST)

74-S. Open Hearth Bath-Temperature Measurement and Control. J. A. Creighton. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 33, 1950, p. 184-186; disc., p. 186.

Previously abstracted from *Journal of Metals.* See item 316-S, 1950. (S16, D2, ST)

75-S. Metal Specifications for the Brass and Bronze Foundry. James G. Dick. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 208-214; disc., p. 214-216.

Previously abstracted from *Canadian Metals.* See item 325-S, 1950. (S22, E general, Cu)

76-S. Metal Composition Tests for the Steel Melter. H. H. Fairfield, H. F. Graham and A. E. McMeekin. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 530-535; disc., p. 535-536.

Previously abstracted from preprint. See item 208-S, 1950. (S11, CN)

77-S. Outline of Inspection for Pearlitic Malleable Castings. D. T. Martin. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 692-698; disc., p. 698.

Foundry, white iron, grind, and finished iron inspection; induced magnetic testing for surface defects; hardness testing; and salvage and returned goods inspection. (S13, Q29, CI)

78-S. Classification, Standardization, and Properties of Bronzes. (In French.) G. Blanc and P. J. Le Thomas. *Fonderie,* Nov. 1950, p. 2257-2266.

Structures corresponding to various compositions and heat treatments are illustrated. Compositions and mechanical properties are tabulated. (S22, Q general, Cu)

79-S. Methods of Measurement Used in French Openhearth Furnaces. (In French.) G. Husson and P. Rodicq. *Revue de Métallurgie,* v. 47, Dec. 1950, p. 937-946.

Temperature and flow measurement and control devices and instruments. (S16, S18, D2, ST)

80-S. (Book) **1950 Supplement to Book of A.S.T.M. Standards Including Tentatives. Part 2. Non-Ferrous Metals.** 223 pages. 1950. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.
(S22, EG-a)

81-S. (Book) **Boiler Construction Code.** 1949 Ed. Secs. I-VII, IX. 1950. Ed. Sec. VIII. Paged by section. American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.
(S22, T25)

82-S. (Book) **Analytical Chemistry of the Manhattan Project.** Ed. 1. Clement J. Rodden, editor-in-chief. 748 pages. 1950. McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. (National Nuclear Energy Series, Div. VIII., Vol. 1.) $6.75.

Past and present practices in the separation and determination of U and Th in many types of materials. Determination of traces of other specific elements or group of elements in various materials. Developments in photometric, electrometric, spectrochemical, low-pressure, radiochemical, and other methods. Extensive chapter bibliographies. (S11, U, Th)

83-S. (Book) **Physical Methods in Chemical Analysis. Vol. I.** Walter G. Berl, editor. 664 pages. 1950. Academic Press, Inc., 125 E. 23rd St., New York 10, N. Y.

Fourteen contributors describe methods that have either proved of considerable value or are destined to play an important role in the future. Various unit operations: the techniques and instruments that can be used by the analyst in the identification, both qualitative and quantitative, of atomic, molecular, and ionic species, crystal phases and arrangements, surface structures and area, etc. Extensive sectional bibliographies. Pertinent sections are abstracted separately.
(S11, M general)

T

APPLICATIONS OF METALS IN EQUIPMENT

61-T. Contact Materials in Telegraph Apparatus. E. B. Gebert and T. F. Cofer. *Western Union Technical Review,* v. 5, Jan. 1951, p. 32-40.

Requirements, properties of the various types, design, and applicabilities. (T1, SG-r)

62-T. Aluminum-Clad Iron for Electron Tubes. W. Espe and E. B. Steinberg. *Tele-Tech,* v. 10, Feb. 1951, p. 28-30, 72.

Claims that "P-2 Iron," a European development, can be used in vacuum-tube manufacture as a substitute for Ni. Details of fabrication

procedures, properties, and applications. (T1, L22, Fe, Al)

63-T. Precision Steel Tubes; Some Industrial Applications of Small-Diameter Bores. *Iron and Steel,* v. 23, Dec. 1950, p. 501-503.

Miscellaneous applications. Selection of alloys for different uses. Use of nonferrous alloys in certain types of tubing. (T7)

64-T. Anodes (Concluded.) (In German.) Edmund R. Thews. *Metalloberfläche,* sec. B, v. 2, Oct. 1950, p. 152-155; Dec. 1950, p. 187-188.

Oct. issue: Zn and Cd anodes, their uses, and harmful impurities in the respective anode metals. Dec. issue: Sn and Pb anodes.
(T5, L17, Zn, Cd, Sn, Pb)

65-T. Outlook for Aluminum in the Automobile Industry. Clay P. Bedford. *Modern Metals,* v. 6, Jan. 1951, p. 22-25.

Present and potential usage without consideration of impact of the war emergency. (T21, Al)

66-T. Aluminum Castings Improve Design of Vaneaxial Fans. F. L. Church. *Modern Metals,* v. 6, Jan. 1951, p. 28-30.
(T10, Al)

67-T. Magnetic Separator Housed in Aluminum. *Modern Metals,* v. 6, Jan. 1951, p. 32.

Principal advantage is the nonmagnetic character of Al. Separators are used in various chemical industries to remove tramp metal.
(T29, Al)

68-T. Modern Aluminum Wall Plates Feature Alumilite Finishes. *Modern Metals,* v. 6, Jan. 1951, p. 34.
(T26, Al)

69-T. Roll-Up Aluminum Doors Easy to Operate; Save Space. *Modern Metals,* v. 6, Jan. 1951, p. 36.

Doors used to cover up sink and range when not in use, in modern kitchenettes. (T26, Al)

70-T. Telescopic Gangway for English Port Has Light, Rugged Aluminum Frame. *Modern Metals,* v. 6, Jan. 1951, p. 38-39.
(T26, Al)

71-T. Magnesium Dockboard Employs Extruded, Cast, and Wrought Parts. Gene Beaudet. *Iron Age,* v. 167, Feb. 1, 1951, p. 107-109.

Just as strong but ¼ as heavy as steel plates, Mg dockboard is finding wide application. Each unit is individually designed. Some carry 30,000-lb. axle loads, but typical designs carry around 1000 lb. (T26, Mg)

72-T. Power Losses in Transmission Line Hardware. E. H. Sparling. *Hydro Research News,* v. 2, July-Sept. 1950, p. 12-15.

Results of laboratory studies, which demonstrate benefits of nonmagnetic hardware. Compares power losses with steel or malleable iron clamps vs. Al alloy clamps. Temperature-rise and mechanical-strength data. Includes economic analysis. (T1, P15, Al)

73-T. Hunt Cites Increased Defense Use of Aluminum Following Korea Outbreak. Roy A. Hunt. *Metals,* v. 21, Jan. 1951, p. 9, 12.

"Outstanding progress" during year in development of new Al and Mg products for aircraft wings.
(T24, Al)

74-T. Ocean Going Cargo—Packed in Aluminum. Hugh G. Jarman. *Canadian Metals,* v. 14, Jan. 1951, p. 38-39.

Use of large Al boxes for handling and shipment of miscellaneous cargo. Advantages are 1000-lb. weight reduction as compared with similar steel containers, corrosion resistance, and security against pilferage.
(T10, Al)

75-T. Communications Metallurgy. Earle E. Schumacher. *Journal of the Institute of Metals,* v. 78, Sept. 1950, p. 1-23.

Function of the metallurgical department in a communications system. The need for metallurgical research and development, the origin of metals problems, requirements imposed on metal components, and integration of metallurgical developments into an operating communications system. Illustrative examples demonstrate the complementary roles of engineering and research in correlating properties of metals with their structure, and structure with fabrication method. (T1)

76-T. Aluminium Conductors: Weight-Saving; Terminals and Methods of Attachment; Cable-Asseembly Tests. W. W. Schumacher. *Aircraft Production,* v. 13, Jan. 1951, p. 21-26.

Comparative data are tabulated and charted. Equipment and terminals are diagrammed and illustrated.
(T1, Al)

77-T. Stainless Steel Trains for New York Subways. *Engineer,* v. 190, Dec. 29, 1950, p. 651.
(T23, SS)

78-T. New Seating for the Orchestra —Royal Albert Hall. *Light Metals,* v. 14, Jan. 1951, p. 4-6.

Magnesium alloy chairs and their assembly. (T10, Mg)

79-T. Ships' Lifeboats. *Light Metals,* v. 14, Jan. 1951, p. 32-35.

Use of Al in 24-ft. lifeboats.
(T22, Al)

80-T. "Holospar" Construction System. *Light Metals,* v. 14, Jan. 1951, p. 44-45.

System of tubular framing and interlocking panels, utilizing the principles of triangulation in bracing joints and a modified form of "stressed skin" effect in panelling, used for panel trucks. (T26, Al)

81-T. Aluminium Composites in Architecture. (Concluded.) Joseph B. Singer. *Light Metals,* v. 14, Jan. 1951, p. 52-56.

The nature and uses of light metal integrally associated with nonmetallic materials in building construction. (T26, Al)

82-T. Wrapping Process for Production of High-Pressure Reactors for Chemical Synthesis. (In German.) Julius Schierenbeck. *Brennstoff-Chemie,* v. 31, Dec. 20, 1950, p. 375-381.

A central cylinder is wrapped with successive layers of grooved and interlocking steel ribbon, the ribbon being electrically heated as it is wrapped, but cooled to room temperature after application. Reactors produced by this method were found to be much stronger than one-piece chambers. (T29, G general)

83-T. Nickel Alloys in Glass and Pottery Production. *Ceramics,* v. 2, Jan. 1951, p. 606-609.

Surveys applications. (T29, Ni)

84-T. Ordnance Holds Key to Vast Iron Powder Growth. Bill Packard. *Iron Age,* v. 167, Feb. 15, 1951, p. 109-110.

Domestic iron-powder capacity will have to be expanded many times its present size if the Ordnance Corps adopts iron-powder rotating bands for shells. A long development program is believed nearing the decision stage now. (T2, H general, Fe)

85-T. Telephone Type Relays; Arc Suppression and Contacts. V. E. James. *Product Engineering,* v. 22, Feb. 1951, p. 136-140.

Electrical characteristics, ratings, and applications of contacts made of different materials and alloys. Protective enclosures for telephone-type relays. (T1, P15, SG-r)

86-T. Production of Earth-Moving Equipment. Rolt Hammond. *Welding & Metal Fabrication,* v. 19, Jan. 1951, p. 11-18.

Forming and welding equipment and procedures used by a British firm. (T4, G general, K general, CN)

87-T. Minor Uses of the Light Metals. I. Titanium in Alloys. *Light Metals,* v. 14, Jan. 1951, p. 46-49.

First article of series on details of some minor applications of Ti, Al, Mg, and Be (T general, Ti)

88-T. (Book) **Materials of Construction.** John H. Bateman. 568 pages. 1950. Pitman Publishing Corp., 2 W. 45th St., New York 19, N. Y.

An engineering text supplying a background of knowledge of the raw materials, properties, and production. Covers mineral aggregates, cementing materials, concrete, structural clay products, building stone, lumber, iron, steel, aluminum, and magnesium. Includes extensive chapter bibliographies.
(T26, Al, Fe, Mg, ST)

89-T. (Pamphlet) **Fifth Annual Report, July 1, 1949 to June 30, 1950.** *Motor Industry Research Assn.* (Brentford, England), Oct. 1950, 53 pages.

Includes reports of current work on leaded fuels, fatigue strength of crankshafts, fuel sprays and lubricating oils for internal-combustion engines, copper-lead bearings, mechanical properties of parts, weathering of body finishes, deep-drawing of sheet metals, and metal finishing. (T21)

90-T. (Book) **Aluminum in Road Transport.** 80 pages. 1950. Northern Aluminium Co., Ltd., Banbury, England.

See Proceedings published by Aluminium Development Association, item 531-T, 1950. (T21, Al)

V

MATERIALS
General Coverage of Specific Materials

12-V. Stainless Is Growing Apace. Richard E. Paret. *Metal Progress,* v. 59, Jan. 1951, p. 58-61.

Present economic and technical status, applications, and future prospects. (T general, A4, SS)

13-V. Nodular Iron—A Bibliography. F. R. Morral. *American Foundryman,* v. 19, Jan. 1951, p. 43-44.

Recent literature on nodular cast iron as additional material to the bibliography published in the July, 1950 issue. (See item 156-V, 1950.) 109 ref. (CI)

14-V. Nickel-Tin Bronzes. James S. Vanick. *Foundry,* v. 79, Feb. 1951, p. 102-107.

Heat treatment, mechanical properties, and applications of the Cu-base alloys known as the "Ni-Vee" bronzes. These bronzes contain about 5% Ni and 5% Sn, although the percentages may be varied for specific purposes, and Pb and Zn may be added to certain analyses.
(Q general, J general, T general, Cu)

15-V. Ga: A Byproduct Metal. A. P. Thompson and H. R. Harner. *Journal of Metals,* v. 191, Feb. 1951, p. 91-94.

History of discovery of the element gallium; its distribution in the earth's crust; minerals with which it is associated; recovery methods; chemical, physical, and mechanical properties; and possible uses. 15 ref. (Ga)

16-V. The Industrial Status of Ductile Iron. A. P. Gagnebin. *Mechanical Engineering,* v. 73, Feb. 1951, p. 101-108.

Reports on progress made thus far, properties being obtained, castings being made, and some of the

(Continued on page 55)

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

SALES ENGINEER: Prominent manufacturer seeks sales engineer for microscopic research instruments for Eastern Seaboard territory with headquarters in New York. Box 3-5.

JUNIOR WELDING ENGINEER: Excellent opening for recent graduate welding or metallurgical engineer with some practical experience in welding. Position involves welding development, procedures, and quality control. Large eastern fabricator of carbon steel and alloy materials. Please furnish details of experience, education, age and expected salary. Box 3-10.

METALLURGIST: Preferably experienced in powder metallurgy, for research and development in established company. Replies confidential. Please state education, experience and salary desired. Box 3-15.

METALLURGIST: Commercial laboratory in Philadelphia desires the services of an all around metallurgist capable of diagnosis and to render opinions. Should be able to help in preparation of specimens for diagnosis. College graduate. Give complete qualifications, experience, references and salary expected. Box 3-20.

RESEARCH METALLURGIST: Recent metallurgical graduate trained in physical metallurgy for an opening in the research laboratory of a large manufacturer of alloy, tool and stainless steels. Some training in X-ray diffraction desirable. In reply provide usual details including draft status and salary expected. Box 3-25.

SALESMAN: Nationally known steel distributor has opening in western New York State for salesman 25 to 35 with some metallurgical experience or training. Sales or mill experience desirable. Give qualifications, education and experience. Enclose photo. Box 3-30.

SALES and DEVELOPMENT ENGINEERING POSITIONS: Manufacturer of stainless steels and high nickel alloys offers good opportunity in responsible positions to two graduate metallurgists, or with equivalent experience. Will consider recent graduates. Positions actually start with training program of six months working along with sales and development engineering training course. Prefer applicants between 26 and 30 who do not have reserve status. Work during the emergency would consist of helping customers with fabrication, engineering and other technical services along with development of new products, applications and alloys. Deferments were obtained for this type work in last war. Box 3-35.

Midwest

METALLURGICAL ENGINEERS: Recent graduates having one or more years of steel mill or other metallurgical experience. Unusual opportunity to gain practical experience by on the job training period in diversified commercial heat treating plants located in East, Midwest and West Coast. Will lead to supervisory, administrative, technical, research or sales engineering positions. Members of our organization are familiar with this advertisement. Box 3-40.

RESEARCH FELLOWSHIPS: Available at Midwestern University to qualified candidates for the M.S. or Ph.D. degree in physical metallurgy. Opportunity to participate in important government sponsored research projects. Box 3-45.

METALLOGRAPHER: Either full time or part time employment on research project with excellent opportunity to learn specialized techniques. In case of part time employment opportunity to obtain metallurgical degree at well-known metallurgy department. Box 3-50.

UNIVERSITY TEACHING POSITION: Rank and salary depending on qualifications. Excellent opportunity to do independent research. Ph.D. degree and some practical experience preferred. Field of specialization, ferrous physical metallurgy. Box 3-55.

METALLURGIST: For nonferrous smelter in Chicago area. Please write full particulars. Box 3-60.

METALLURGICAL ENGINEER: For development work and establishing processing standards for producing nonferrous alloys in extrusion and finishing of copper-base nonferrous alloys. State full qualifications, salary expected and all personal data in first letter and enclose recent photograph if available. Box 3-65.

PHYSICAL METALLURGIST: For exploratory research and development activity. Experience in behavior of metals during fabrication into devices is essential. Must have desire and ability to do creative work. Exceptionally interesting work available for a metallurgist with an excellent record. Write Borg-Warner Central Research Laboratory, Bellwood, Ill.

RESEARCH METALLURGISTS: Excellent openings for metallurgists with interest and knowledge of modern research methods in foundry, welding and nonferrous fields. Advanced college training desired but not essential. Should be able to initiate and execute overall research program. Excellent opportunities for advancement in growing organization. Write Metals Dept., Armour Research Foundation, Chicago 16, Ill.

METALLURGIST: For control and development work in melting, casting, and hot and cold working operations involved in producing aluminum wire, rod, bar and shapes. Should have a minimum of two years experience in similar work either ferrous or nonferrous. Write Employment Supervisor, Industrial Relations Dept., Kaiser Aluminum & Chemical Corp., Box 671, Newark, Ohio.

RESEARCH METALLURGIST: With background in ferrous foundry metallurgy. Research project work deals with investigation of foundry processes, materials and products. Box 3-75.

ASSISTANT WELDING RESEARCH ENGINEER: Recent graduate, metallurgical or electrical engineer with welding training. Excellent opportunity for advancement. Research and development in welding processes, design and application of mild steel, low-alloy steel, aluminum and stainless steel. Transition temperature studies. Applicants must be resourceful. Box 3-80.

METALLURGICAL ENGINEER: For research work on high-temperature insulation and high-temperature metallurgy. Work is in connection with improving present high-temperature electrical heating elements by means of new and improved materials and improved design. Work will also require determination of materials and designs for high-temperature applications, including jet aircraft parts, heaters for atomic laboratory processes, and industrial heating applications. One or two years experience preferred, recent graduate will be considered. Box 3-85.

ENGINEER: For design and development work, mechanical or electrical, to work primarily on new products to be used in electric heat applications such as cartridge elements, strip elements, disk elements, immersion heaters, plus a line of thermostats. One or two years experience preferred but will consider recent graduate. Box 3-90.

PLANT MANAGER—METALLURGIST

Nationally known manufacturer is planning to operate a magnesium plant, Pidgeon process, for the government. Has interesting opening for plant manager, age 35 to 45, with a degree in metallurgy, and with proven management and supervisory experience. Successful applicant will be considered for permanent position after end of this operation. Company provides complete insurance program. Salary commensurate with experience and ability. All replies held in strictest confidence. Interviews to be arranged for those meeting requirements. Submit complete resume of past training and experience to Box 3-210, *Metals Review*.

METALLURGIST: Graduate engineer, experienced, to set up metal control laboratory. The successful applicant must be able to correctly analyze all types of forging steels. Write giving resume of experience, education, age, marital status. Box 3-70.

TOOL DESIGNERS: (TWO) for Civil Service opening. To work out designs for lathe tools, tool holders, boring bars, shaper and planer cutters, milling cutters, etc. and design dies used in blanking, shearing, punching, and forming of sheet metal, drop forging dies, etc. Applicants must have had at least four years experience in field of tool and die design or tool and die making, and must have had at least two years of experience as tool and die designers, or may substitute successful completion of four year mechanical engineering course for two years of required experience. Box 3-200.

West

MATERIAL ENGINEER: Large metal producer will consider applications for position as material specification coordinator. Engineering or metallurgical background with several years experience in light alloy and/or aircraft industries desirable. Box 3-205.

POSITIONS WANTED

HEAT TREATING FOREMAN, TROUBLE SHOOTER, or INSTRUCTOR: Substantially versed in all phases of specialty and production type steel heat treatment. Over 20 years experience, 5 as foreman. Full and complete details relating to qualifications upon request. Box 3-95.

HIGH TEMPERATURE METALLURGIST: Age 30. Single. B.S. in metallurgical engineering. Experienced in alloy development, materials laboratory supervision, jet engine production and operational material problems. Aggressive, responsible, and capable organizer. Desires responsible position with progressive firm in supervision, development and/or technical control. Box 3-100.

MATERIALS ENGINEER, METALLURGIST, or LABORATORY SUPERVISOR: M.Sc. having sound knowledge of engineering materials, metallurgy and chemistry. Familiar with heat treating, machining, and other fabricating processes, as well as shop problems and critical material substitutions. Able to solve difficult materials and processing problems. Broad experience in production and quality control of end-products, including selection, processing and proper use of raw materials. Box 3-105.

METALLURGIST: Seventeen years experience in metallurgical control, research, and development on ferrous and nonferous alloys. Presently employed as chief metallurgist supervising sand control, gating, heat treatment, metallurgical quality control, and development in one of the largest nonferrous foundries specializing in light alloy castings, such as jet engine parts. Experienced in trouble shooting, consulting work, and as an executive. Desires responsible position with greater future possibilities. Age 38, married. Box 3-110.

WELDING AND METALLURGICAL ENGINEER: Long experience with welding and fabricating of all metals by all manual and automatic, gas and arc welding processes. Desires position in sales or sales engineering of welding equipment and supplies or of welded alloy products. Now located in the East but will consider any location with good future. Box 3-115.

METALLURGICAL ENGINEER: Ph.D., age 36, married. Ten years research and industrial experience. Have organized and directed corrosion research. Active in development of alloys, permanent mold casting and design. Some precision casting experience. Familiar with research techniques and production problem solutions. Offers initiative and original thinking. Desires position of responsibility in research or production. Presently directing nonferrous research. Box 3-120.

MANUFACTURERS' REPRESENTATIVE: Interested in acquiring good industrial lines. Large following developed during past 15 years in upper New York State. Has had 22 years proven sales record with large eastern nonferrous metal industrial concern. Box 3-125.

POSITIONS WANTED

METALLURGICAL ENGINEER: For the company needing a high caliber man having the education, experience, personality, and drive to become an important executive. B.S., M.S., predoctorate work. Experience includes steel apprenticeship, designing and heading quality control and research laboratories, ordnance and aircraft, contact work, drop forging, fabrication and teaching. Age 33, married. Box 3-130.

RESEARCH METALLURGIST: Young, married. Graduate degree. Four years teaching experience on graduate level, academic and industrial research experience in large research institutes and industries respectively, specializing in mechanical metallurgy, crystal plasticity, X-ray diffraction and metal physics. Available November 1951. Box 3-135.

ENGINEER: Registered professional engineer. B.S. in chemical engineering. Age 35, married. Thirteen years as tool designer, heat treat foreman, head of process control laboratory, plant metallurgist, trouble shooter in manufacture of office machines and electrical equipment. Knows ferrous, nonferrous and nonmetallic materials. Desires responsible engineering position. Currently employed. Prefers southeast. Box 3-140.

METALLURGICAL ENGINEER: B.S. degree from Carnegie Tech. Employed in quality control. Desires position where education is more fully utilized. Professional interests not yet fully crystallized. Age 26. No geographic preference. Box 3-145.

METALLURGIST: At present in South America; native of midwest. B.S. degree and graduate work. Over 10 years experience in heat treating, engine test and inspection, blast furnace operation, foundry work. Now superintendent of small foundry in South America. Midwest location preferred but all propositions considered. Box 3-150.

SALES ENGINEER or FIELD SERVICE ENGINEER: Ten years experience in aircraft industry in both design and sales. Now have an account of electrical equipment. Good personal contacts on Pacific Coast. Would consider additional accounts or exclusive account in electrical or mechanical equipment. Prefer Pacific Coast or western states. Age 30. Box 3-155.

PHYSICAL METALLURGIST: Two years experience as instructor in physical metallurgy, two years Manhatten Project, five years metallurgy department of research laboratory of large communication corporation. M.S., Ph.D. B.S. in metallurgical engineering. Author of many technical papers. Desires position with supervisory responsibilities. Box 3-160.

METALLURGIST: B.S. and M.S. in metallurgical engineering. Seven and one-half years experience in steel mill, steel forging plant, industrial heat treating, foundry research and applied physical metallurgy. Interested in development or technical sales engineering. Age 29, married, 2 children. Veteran. Willing to travel. Prefers midwestern or western location. Box 3-165.

(Continued from page 5)

special features that have been developed which bear on potential for future growth. 10 ref. (CI)

17-V. The Alchemist and the Alloy. *Steelways,* v. 7, Jan. 1951, p. 30-32.

Role of phosphorus in high-strength structural steel. Mining and preparation of phosphorus. Applications of the steels. (T general, AY)

18-V. Heat-Resisting Steels. J. F. Sewell. *Murex Review Limited,* v. 1, no. 7, 1950, p. 144-160.

Compositions, microstructures, properties, and applications. (SG-h, ST)

19-V. Recent Progress in the Production and Fabrication of Stainless Steels With Particular Reference to Sheet and Strip. *Metallurgia,* v. 42, Dec. 1950, p. 367-371.

An illustrated survey. Includes plant-layout diagrams and a table showing compositions, physical, mechanical, and fabrication properties of nine stainless steels. (SS)

20-V. Copper and Copper Alloys; Technical Progress in 1950, E. Voce. *Metallurgia,* v. 42, Dec. 1950, p. 382-391.

135 references. (Cu)

21-V. Die-Block Steels for Drop Forging; Composition and Treatment. H. J. Merchant. *Metal Treatment and Drop Forging,* v. 18, Jan. 1951, p. 13-21, 24.

Requirements and selection of steels for die blocks. Method of fabrication, heat treatment, hardness, and testing of die-block steels. Brief reference is made to future trends. (T5, F22, TS, SG-j)

22-V. Palladium Alloys. A. D. Merriman. *Metal Treatment and Drop Forging,* v. 18, Jan. 1951, p. 23-24.

Properties, methods of fabrication, and applications. (Pd)

23-V. A New Medium-Strength Wrought Light Alloy of the Aluminium-Zinc-Magnesium Family — T.35. J. F. G. Herenguel. *Metal Treatment and Drop Forging,* v. 18, Jan. 1951, p. 33-36.

Previously abstracted under similar title from French version in *Revue de l'Aluminium.* See item 146-V, 1950. (Al)

24-V. High Grade Special Bronzes. (In German.) E. Weisner. *Metall,* v. 5, Jan. 1951, p. 5-8.

Compositions; mechanical, chemical, thermal, and electrical properties; and specific uses of binary and polynary alloys of Cu with Al, Ni, Mn, Ag, Si, Be, and Pb, with or without other elements as secondary ingredients or impurities. (Q general, P general, T general, Cu)

25-V. Manufacture and Properties of Resistance Wires Containing 82.5% Cu, 12.0% Mn, 4.0% Al, and 1.2% Fe. A. Krupkowski and I. Z. Misiolek. (In Polish) *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa,* v. 2, no. 4, 1950, p. 273-284.

Literature on resistance wires used for electrical heating and measurements is reviewed. An alloy called "novo-Constantan" was chosen for investigation. Conditions of melting and casting. Chemical composition, microstructure, Brinell hardness, specific gravity, and melting point of the cast alloy. Annealing procedures. (Cu, SG-q)

26-V. Bearing Alloys. (In Polish.) S. Balicki. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa,* v. 2, no. 4, 1950, p. 327-338.

Bearing alloys subdivided into 10 groups—their most important characteristics. Manufacture by static casting, by centrifugal casting, and by application of a continuous steel strip. Percentage use of various bearing alloys in bearing production, their relative production costs, typical installations of the most heavily loaded bearings, and average bearing life. Replacement of Sn-bearing alloys with alloys containing only 6-16% Sn. Electroplating upon the bearing surface of a thin layer of Pb-Sn alloy often followed by indium diffusion treatment. 24 ref. (T7, SG-c)

27-V. Trends in Aluminum Casting Alloys. Walter Bonsack. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 69-75.

Development of common casting alloys in the U. S. Structure and mechanical properties. (E general, Q general, M27, Al)

28-V. Characteristics of Some Aluminum-Zinc-Magnesium-Copper Casting Alloys. W. E. Sicha and H. Y. Hunsicker. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 333-341; disc., p. 341-345.

Previously abstracted from preprint. See item 112-V, 1950. (E11, E12, Q general, Al)

29-V. Development of High-Strength Magnesium Casting Alloy ZK61. J. W. Meier and M. W. Martinson. *Transactions of the American Foundrymen's Society,* v. 58, 1950, p. 742-750; disc., p. 750-751.

Previously abstracted from preprint. See item 113-V, 1950. (J general, Q general, Mg)

30-V. (Pamphlet) Magnesium Alloys and Products. 1950, 74 pages. Dow Chemical Co., Midland, Mich.

Forms in which Mg alloys are manufactured. Physical and mechanical properties. Includes tabular data. (Mg)

POSITIONS WANTED

MECHANICAL ENGINEER: Desires position as plant or production superintendent. Has had 21 years in steel fabrication, past five years as plant superintendent in the manufacturing of pressure vessels and large-diameter line pipe operating two pipe mills and vessel plant. Nine years superintendent on refinery construction. Will relocate. Box 3-170.

METALLURGIST: B.S. Six and one-half years experience in O. H. and rolling mills, one year as foreman. Experienced in ballistic limit testing of armor plate and in plastics. Desires position as plant metallurgist or supervisor. Age 35, married, family. Veteran. Box 3-175.

METALLURGICAL ENGINEER: Interested in position in production line in metallurgical field. M.S. in metallurgical engineering. Age 32, married. No location preference. Box 3-180.

METALLURGICAL ENGINEER: Married. Equivalent of M.S. degree in metallurgy, Stevens Institute of Technology 1948. Thesis in powder metallurgy. Twelve years experience in laboratory and production in nonferrous and ferrous metals. Desires position in the east. Complete resume of experience on request. Box 3-185.

METALS TECHNICIAN: Age 36, married. Academic and 13 years industry and government experience. Inorganic chemistry, nonferrous and physical metallurgy background; materials engineering; corrosion problems; silver brazing alloys and flux developments; electroplating, precious and platinum group metals; analytical chemistry; physical testing; metallography. Desires responsible position in Southern Connecticut or New York City area. Box 3-190.

MANUFACTURERS' REPRESENTATIVE: Interested in contacting companies desirous of developing their trade in Peru. Has had 20 years of successful sales experience in Latin America and a well-grounded knowledge of trade practices and conditions there. Box 3-195.

EQUIPMENT WANTED

1 only non-ferrous melting furnace, capacity 2,000 lbs. Montreal Bronze Limited, 999 Delorimier Avenue, Montreal 24, Quebec.


ALS.